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THE

CYCLOPÆDIA;

OR,

Universal Dictionary

OF

ARTS, SCIENCES, AND LITERATURE.

VOL. XV.

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THE

CYCLOPÆDIA;

OR,

UNIVERSAL DICTIONARY

OF

Arts, Sciences, and Literature.

BY

ABRAHAM REES, D.D. F.R.S. F.L.S. *S. Amer. Soc.*

WITH THE ASSISTANCE OF

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CYCLOPÆDIA:

OR, A NEW

UNIVERSAL DICTIONARY

OF

ARTS and SCIENCES.

FOOD.

FOOD *of* PLANTS, in *Agriculture* and *Vegetation*, the various kinds of fine attenuated and elaborated materials which are abforbed from the furrounding atmofphere, or taken up from the foil, in order to their nourifhment and fupport. It feems not improbable but that many of the more fluid and elaftic matters of nature may contribute in this way. The more ancient writers were extremely anxious to afcertain the nature of the *pabulum*, or food of plants, but their inquiries on the fubject were far from fatisfactory. They afcribed the growth and increafe of plants to feveral different matters, as water, air, earth, fire, &c.; and even to the neutral falt, known by the name of nitre. But they were not able to fhew which of them was properly the food of plants. Van Helmont was ftrongly in favour of water; Bradley contended for its being air, while Lawrence and others fupported the opinion of its depending on fire. And a great number of more modern authors have ftood forward in fupport of earth, and nitre as the food of plants. The matter, however, continued in this unfettled ftate, until the improvements of the French chemifts threw additional light upon it, by fhewing that various gafeous, liquid, carbonaceous, and other fubftances, either in their fimple or combined ftates, were effential to the nourifhment and fupport of vegetable life.

Further inquiries into the nature and principles of vegetation, and the manner in which it is performed, are however highly deferving of the attention of thofe who are engaged in the cultivation of the foil, as upon the knowledge of thefe in a great meafure depends, not only the improvement of hufbandry, but the advantageous production of different forts of plants, as crops. The agriculturalift fhould indeed be in poffeffion of the full and complete knowledge of the means by which all the various forts of ufeful field plants are beft capable of being raifed, fupported, and brought to perfection. A juft and exact notion of thefe muft contribute greatly in directing and affifting him in the care and management of his lands and crops, as well as in fhewing the moft advantageous ftates and conditions of the ground for affording the nourifhment and fupport of the plants, in the moft eafy, abundant, and expeditious manner.

The refearches of doctor Ingenhoufz throw confiderable light not only on the nature of the food of plants, but likewife on the renovation and improvement of foils. It is contended by this ingenious philofopher, in an able effay, inferted in the thirty-feventh volume of the Annals of Agriculture, that the fureft way of finding out the real nourifhment of organized bodies, feems to be to inquire what is the fubftance without which they inevitably perifh, and which alone is fufficient to continue their life. All animals require two ingredients for the continuation of their exiftence; *viz.* atmofpheric air, and moift food, derived either from animal or vegetable fubftances; which food being received into the ftomach or fome refervoir deftined for that purpofe, and being gradually digefted and changed into different fubftances in the different organs, is applied to the whole economy of the animal body. Vegetables being deprived of progreffive motion, by which means the greateft number of animals go in fearch of food, muft find in the narrow compafs or fpace they occupy every thing neceffary for their fubfiftence. As they are in contact with two fubftances only, the earth and the atmofpheric air, their nourifhment muft, he thinks, exift in either of them, or in both. The earth is neceffary to the plants, as the only means to fix them ftedfaftly to the fpot, by fpreading through it their roots; but as earth contains generally moifture, falts, air, &c. nature has taken advantage from this circumftance, fo that the filaments of the roots pump from the foil all that

is offered to their suckers, and can be absorbed by them; but as some plants may live and thrive without being in contact with any earth, we ought to take it for granted, that the soil, or what exists in the soil, is not the only food of plants. Water is necessary to all organized beings, as without it no circulation of juices could be carried on, but from this necessity it can only be deduced that water is a vehicle of the food, and by no means that it is the true nourishment of animals or vegetables; the less so, as it is an incontrovertible fact that several plants can live without being in contact with water. Thus the agave, cactus, aloe, cacalia, &c. live on the most dry rocks in the hottest climates, where it does not rain sometimes in the space of several months, and where the burning sun pierces all other plants, and even deprives the trees of all their leaves, and what is extraordinary, almost all the parts of such plants are full of juices. The nocturnal dew, it is supposed, cannot give sufficient nourishment to such plants, as all other plants would also maintain themselves with it. But to be certain that those plants do not subsist by dew, we ought to consider only that some plants of that species may be kept alive in the hot houses, either in pots, without being watered, or by hanging them up from the cieling. Now, as by what he has said here, it seems, the writer thinks, to be probable, that neither water nor soil is or contains all the true nourishment of vegetables, it must be concluded, that plants must find it in the atmospheric air, for this, it is asserted, is the only ingredient, without which all vegetables perish. A plant shut up in vacuo soon dies, and it dies in all sorts of aerial fluids, which are incapable of supporting animal life; such as carbonic acid gas, or fixed air, hydrogen gas, or inflammable air, phlogisticated air, or azote, &c. It is true, he admits, that doctor Priestley and Mr. Scheele have propagated a doctrine diametrically opposite to what he has here advanced, by saying that plants thrive wonderfully in putrid air, and perish in pure or dephlogisticated air. This doctrine, though generally adopted, and very ingeniously applied by sir John Pringle and others to illustrate the mutual resemblance established by the author of nature between the vegetable kingdom, and the animal creation, is, it is conceived, refuted by his experiments, by which he thinks, he has proved, that plants shut up in vital air live so much the longer, as this air is superior in purity to atmospheric air. In his "Expériences sur les Végétaux," tome ii. he has explained the manner of making these experiments with success; and has shewn the reason why, of two plants, the one shut up with common air, the other with the same quantity of vital air, (both kept in the dark,) the plant placed in common air can only be kept alive during a certain very limited time, whereas the plant shut up in vital air may be kept alive much longer, even as long as there is vital air enough remaining to cover the whole plant.

From these and many other considerations, he has deduced that from the two organized kingdoms, the animal and the vegetable, the animal derives its nourishment from the vegetable; but that the vegetable creation is independent of the animal world, provides for itself, and derives its subsistence chiefly from the atmosphere.

It is stated, that when he engaged in the experiments on vegetables, which he published in 1779 in English, and in 1780 more fully in French, Dr. Priestley had already observed, that vegetables possessed a power of correcting bad air; which however was denied by Mr. Scheele in Sweden, who found that plants, instead of correcting bad air, corrupted good air. This contradiction struck Dr. Priestley so much, that he employed the summer of 1778 in repeating his former experiments; and after the most accurate researches he concluded, that though there seems to be such a power in plants, yet that very often they have quite a contrary effect, as Mr. Scheele found; but that he did not know what the reason of this uncertain effect of plants on air was. In 1778 he found, by accident, that by exposing well-water a long while to the sun, it produced a filmy greenish sediment, which produced pure air in the sunshine: by examining this matter with a microscope, he found it destitute of organization, and pronounced it to be neither an animal nor a vegetable substance, but a substance *sui generis*, to which he gave the name of green matter. M. Berthollet found also, that by exposing dephlogisticated marine acid to the sun, vital air was produced; and Mr. Scheele in Sweden found that the same air was also produced from nitrous acid, exposed to the light of the sun. Dr. Ingenhousz asserts, that he was fortunate enough to discover the true reason why plants did sometimes correct bad air, and sometimes made it worse, which reason was never so much as even suspected by either of the above-mentioned philosophers. He discovered, in the summer of 1779, that all vegetables are incessantly occupied in decomposing the air in contact with them, changing a great portion of it into carbonic acid gas or fixed air, which being specifically heavier than atmospheric air, tends naturally to fall downwards, and being miscible with moisture, salts, and different sorts of earthy substances, is apt to combine with them. He also found that the roots, flowers, and fruits, are incessantly employed in this kind of decomposition, even in the middle of the sunshine; but that the leaves and green stalks alone cease to perform this operation during the time the sun, or an unshaded clear day light, shines clear upon them, during which time they throw out a considerable quantity of the finest vital air, and moreover make the air in contact with them purer, or more approaching to the nature of vital air. He has indeed stated facts which prove that vital air, produced by vigorous plants in the sunshine, is of the greatest purity in itself; and that the air thrown out by them in the shade, or in the dark, is in itself, that is to say, being free from other air, the most active poison in destroying animal life yet known.

He does not doubt but that this continual decomposition of atmospheric air must have a general utility for the subsistence of the vegetables themselves, and that they principally derive their true food from this operation, by changing this decomposed air into various juices, salts, mucilage, oils, &c. much the same as in graminivorous animals, the simple grass changes in the various organs, into the numerous and very heterogeneous fluids and solids. It would, however, he thinks, be a very difficult, if not impossible task, to give a clear and satisfactory theory, by which these various changes, compositions, decompositions, new combinations, &c. performed upon one single species of food, such as grass, may be explained. The same incomprehensible transformations are going on in vegetables. If once it was satisfactorily proved, that plants can subsist in what they find in atmospheric air without any other substance, we ought, he thinks, to content ourselves with the fact alone; for it would be in vain to attempt to penetrate the mystery of all the changes this air undergoes in the organs of these living beings; no more need we wish anxiously to investigate by what means, in a man who lives only on rice and water, all the various transmutations of this simple food are performed. This mystery is, it is supposed, above the reach of our very limited understandings. The new light which chemistry has received in our age, affords us the means of understanding many phenomena which we were either ignorant of,

of, or which nobody underſtood any thing of before. The new diſcoveries in the nature of water, air, ſalts, &c. open the door to an infinite number and variety of new diſcoveries. The identity of the ſame principle of all acids, called oxygen, which the French chemiſts have eſtabliſhed, throws new light on the difference which exiſts in the various acids already known, and on the changes which theſe acids undergo. Thus, the ſame acidifying principle attaching itſelf to a different baſis, becomes either nitrous, vitriolic, marine, or any other acid. With carbon it becomes fixed air, or carbonic acid gas, with ſulphur it becomes vitriolic or ſulphuric acid; with phoſphorus it becomes phoſphoric acid; with azote it becomes nitrous acid, &c. The laſt was a diſcovery made by Mr. Cavendiſh. It may thus, the writer thinks, be reaſonably ſuppoſed, that ſome acids taken into our body may loſe in the various operations of our organs their former radical and combine with a new one, and by this combination entirely change their nature. Without ſuch like changes taking place in our organs, how could we account for the generation of the great quantity of phoſphoric acid exiſting almoſt every where in our bodies, (which acid has already got the name by ſome eminent chemiſts of *animal acid*,) principally in our bones? Whereas we find no where the marine acid, though of all acids we take in the greateſt quantity of it. We find in ſeveral liquids its baſis, the foſſil alkali; as in bile, urine, &c.: but we find nothing of its acid, nor even the marine ſalt undecompoſed, except in the ſerum of the blood, and the *chylus*, in which this ſalt has not yet undergone the elaboration of the vital organs. It ſeems, therefore, as if all the acids, the marine, the vegetable, the carbonic, &c. were in our organs transformed, for the greateſt part, into the animal or phoſphoric acid. It appears, at leaſt, probable, that without ſuppoſing this change of acids to take place in our bodies, we could not account for the great abundance of phoſphoric acid exiſting in our bodies; for though it really exiſts in ſome of our foods, yet the quantity of it is but trifling.

It is farther contended that if plants imbibe fixed air, or carbonic acid gas, it is not more difficult to believe that this ſubſtance may be transformed, elaborated, or modified into various other ſubſtances and ſalts in the organs of the plants, than it is difficult to believe that the above-mentioned changes take place in the human body. Who can believe, without demonſtrative proof, that the aerial fluid, the carbonic acid gas, conſtitutes about $\frac{40}{100}$ of limeſtone; and that this ſtone having loſt its hardneſs, by being deprived of this aerial fluid, regains its former conſiſtency by recovering this fluid? As the carbonic acid is compoſed of the acidifying principle, the oxygen, and the carbon or coal, plants may derive from theſe two principles ſome of the moſt eſſential ſubſtances we find in them; their acids, their oils, their mucilage, &c.; theſe ingredients, together with the azote abſorbed alſo with the atmoſpheric air, being elaborated in their organs, ſomewhat analogous to the wonderful, though to the human underſtanding incomprehenſible, elaborations and combinations which we obſerve in the bodies of animals. M. Haſſenfratz's three papers on the nouriſhment of plants, delivered in 1792 to the Royal Academy of Paris, have met with very general approbation; and the principal part of the doctrine contained in them, *viz.* that *coal*, or carbon, *conſtitutes the principal nutritive ſubſtance of plants*, has been adopted by the celebrated Mr. Kirwan, in his "Diſſertation on Manures," ſome time ſince preſented to the attention of the agriculturaliſt.

In the firſt it is contended that water and air are not alone ſufficient to nouriſh plants, but that the developement or growth of theſe matters is owing to the carbon, which, being originally lodged in the ſeed, is expended in this buſineſs. In the ſecond, the writer attempts to prove that the carbonic acid, or fixed air, is not a nutritive ingredient of plants, and that the act of vegetation does not decompoſe the carbonic acid; but, on the contrary, this carbonic acid is, as Dr. Ingenhouſz has diſcovered, formed by plants in the dark, and drawn from the plants and the oxygen of the water decompoſed by vegetables. Mr. Kirwan, however, differs in this reſpect from M. Haſſenfratz, and thinks that the carbonic acid is decompoſed by the act of vegetation. In the third paper, it is aſſerted that the carbon, the true nouriſhment of plants, is derived by the roots from the ſoil, where it is found ready in a ſtate of ſufficient ſolution or ſuſpenſion to be abſorbed by the ſuckers, and carried through the whole plant. It is thought that the vigour of the plants depends chiefly upon the quantity of carbon with which the ſoil is impregnated; and the name of carbon is given to the brown ſediment of the infuſion of dung which remains after the water is evaporated or conveyed away by the action of heat, &c.

But the doctrine contained in theſe memoirs, as well as the important experiments to which they relate, require, in Dr. Ingenhouſz's opinion, farther inveſtigation, before it can be proved or clearly underſtood. The following hints and conſiderations may, it is ſuppoſed, perhaps ſhew the way towards the true myſtery of the manner which nature employs to feed the plants. All ſeeds contain a certain quantity of food, by which the plant may be kept alive in the beginning of its growth; ſome have a conſiderable portion of mucilaginous matter, ſuch as the ſeed of quince; ſome have, beſides this mucilage, a very thick cover or pulp, by which the ſeed is ſurrounded, ſuch as the ſeed of grapes, apples, pears, melons, cucumbers, &c. which ſubſtances ſerve alſo as food for animals. All thoſe ſubſtances by which many grains are thickly covered, yield a great quantity of fixed air, or carbonic acid gas, when the ſeed lodged in them begins to vegetate; but this ſubſtance, being exhauſted at the cloſe of their fermentation and putrefaction, the embryo plants muſt be capable of providing for themſelves. A new-born child may alſo live a few days without food, being nouriſhed by ſome nutritious matter which it brings with it when born, and which it had imbibed by the mouth when in the womb, and part of which nouriſhment was prepared in the pectoral gland of the child; as it is well known that all children, male as well as female, come into the world with a portion of true milk elaborated in their breaſts. Thus alſo, the yolk of the egg is drawn into the ſtomach of the chick when ready to break its priſon, by means of which yolk it is nouriſhed till it has acquired ſtrength enough to go in ſearch of food. The mothers of animals, endowed with breaſts, feed, during a certain time, their offspring by their milk. Many animals, ſuch as birds of different kinds, wander about in ſearch of food to be carried to their young. Very few animals find, on the ſpot where they exiſt, every thing they want. But all plants are deſtined by nature to remain on the ſame ſpot, and therefore muſt poſſeſs ſuch faculties as prepare into food ſome of the ſubſtances in contact with them, as ſoon as they have conſumed the ſmall ſtore of food they are provided with before they vegetate. As the very firſt decompoſition of the pulp ſurrounding the ſeeds is accompanied with the production of carbonic acid gas, and the firſt operation of the embryo, or beginning plant, is to decompoſe the air in contact with it, by changing the oxygenous part of it into carbonic acid gas, of which it probably abſorbs, in the

 dark

dark and ſhade, the oxygen, and, in the ſunſhine, the carbon, throwing out at the ſame time the oxygen alone, and keeping the carbon to itſelf as nouriſhment; as all theſe different operations have one general effect, *viz.* the decompoſing the air in contact with plants, it ſeems more than probable that vegetables derive their principal food from this decompoſition, and the production of fixed air, or carbonic acid gas. This ſuppoſition will, it is contended, acquire a degree of greater probability by conſidering, that all airs which cannot be eaſily changed or decompoſed into fixed air, as poſſeſſing no oxygen at all, are true poiſons to plants, ſuch as hydrogen or inflammable air, putrid air and azote, contrary to Dr. Prieſtley's and Mr. Scheele's doctrine; and that vital air itſelf, or an air approaching to its nature, maintains a plant remarkably well in its full vigour, and that carbonic acid gas concentrated, or without a great portion of reſpirable air, kills alſo plants, as this air and all other airs, poiſonous to vegetable life, are alſo deſtructive of animal life; which doctrine the writer offered firſt, in contradiction to that of the two celebrated philoſophers juſt mentioned. Dr. Ingenhouſz ſhould, however, have proved the firſt poſition by experiments, in oppoſition to thoſe of Mr. Young and other inquirers, as the firſt has, he aſſures us, fed plants with hydrogen or inflammable air, till they became, comparatively ſpeaking, giants among dwarfs. How then, he aſks, does it act as a poiſon? If nothing elſe be given, it may, as the moſt nutritious food may, ſuffocate animals. Dr. Ingenhouſz, however, ſtates, that when he diſcovered, in 1779, that all vegetables decompoſe the common air by night, and change a part of it into fixed air; and when he drew from this and ſome other facts the concluſion, that the plants abſorb this fixed air and turn it into their nouriſhment, the new doctrine of chemiſtry was not publiſhed; and, being ignorant of all the beauties of that ſyſtem, he was unable to reduce theſe facts to a proper theory: but ſince we have been inſtructed in the analyſis of water and air, it is become, he thinks, much eaſier to explain the phenomena of vegetation. As it is now admitted that fixed air, or carbonic acid gas, is compoſed of oxygen deprived of its caloric, or matter of heat, and of carbon, it is not difficult to underſtand how plants provide or prepare their own nouriſhment by producing carbonic acid, ſuppoſing it to be demonſtrated that carbon is the principal nouriſhment of plants, as hinted above.

It is further ſuggeſted, that from this doctrine it would naturally be inferred, that plants muſt grow the moſt rapidly at ſuch time as they prepare the greateſt quantity of this nouriſhment, which is when they are in the dark; and this is juſt what really happens, as all plants grow with much more rapidity in a dark place than in the light, as M. Du Hamel and M. Bonnet, of Geneva, found. Plants in general grow leſs, it is ſuppoſed, towards the middle of the day than at any other time; many do not advance at all when the ſun is near the meridian; ſome even become manifeſtly ſhorter towards that time of the day.

The writer has alſo diſcovered that the roots of plants, even when expoſed to the ſunſhine, produce carbonic acid gas, but that the leaves and green ſtalks produce this acid only in the dark; and that flowers and fruits, with a few exceptions among the laſt, produce at all times, even at the roots, carbonic acid. Thus there is no time loſt, ſome parts, or the whole plant, being conſtantly employed in this buſineſs of preparing carbonic acid. Though M. Haſſenfratz ſeems to believe that plants do not derive the carbon (in his opinion their true nouriſhment) from the carbonic acid, but find it ready made in the dung; the doctor, however, thinks it more probable that plants derive it chiefly from the carbonic acid, which is a ſubſtance very eaſily decompoſable into its two ingredients, *viz.* oxygen and carbon. All manures, but principally dung, produce a great quantity of carbonic acid either by themſelves, or by decompoſing the air in contact with them. But here, ſays he, ſeems to ſtart up a difficulty, how a plant or manure can draw from the atmoſpheric air carbonic acid, as common air contains, according to the new ſyſtem, only $\frac{1}{100}$ of it, and, according to M. Lavoiſier, none at all. Though, according to theſe principles, it could not be accounted for theoretically, it is thought we have at hand facts enough, from which it ſeems evident, that the common air can by itſelf furniſh all the ingredients for the compoſition of carbonic acid, as we ſhall ſee bye and bye.

It is ſuggeſted, that we are as yet very far from underſtanding the various productions, which in this world are expoſed to our ſenſes as offſprings from the infinite combinations, decompoſitions, chemical affinities or attractions, &c. every where in action, on the ſurface, and in the bowels of the earth, in the atmoſphere, the waters of the ſea, and all others in the organized bodies of animals, vegetables, &c. The new ſyſtem of chemiſtry, indeed, furniſhes a vaſt deal of new light, but is yet by no means ſufficient to penetrate into the deep myſteries of organized beings; for inſtance, the propagation of animals and vegetables has, the writer thinks, acquired from it but very little, if any light at all. But to return to the ſubject of the production of carbonic acid. Calcareous ſtones and alkaline ſalts, deprived of their carbonic acid by fire, regain it ſolely by the expoſure to the open air. If this production can happen by ſuch ſimple means, can we be aſtoniſhed that organized bodies draw it from the ſame ſource, the atmoſphere; which to him ſeems to be the general magazine or ſtore-houſe of all the ſubſtances which enter into the compoſition of all organized bodies of the animal and vegetable kingdom, and even many others of the mineral kingdom in addition.

It is further remarked that M. Du Hamel found that a branch of a vine, or any other tree, conducted within a hot-houſe, its root remaining out of its boundaries, will there ſhoot forth vigorous leaves, new buds, flowers, and produce fruit, when all the other branches remaining expoſed to the open air, ſhew no ſigns of life; being, with their roots benumbed by the cold, and probably deſtitute of any motion or circulation of their juices. If the growth of vegetables depended on the abſorption of carbon by their roots, the branch drawn into a hot-houſe could not, the doctor ſays, thrive at all, as long as the root and ſtem were benumbed by cold weather. But this branch, being in contact with no ſubſtance but air, heat and light, muſt derive from the ſurrounding air alone all it wants, to perform all the operations neceſſary to its growth and propagation. By watching all its phenomena, it will be found decompoſing the air in contact with it, but in a very different way by day and by night; and that it performs theſe tranſmutations of air chiefly within its organs, is the more probable, becauſe all plants abſorb the air in contact with them, with all its contents, and throw it out in a given time much altered from what it was at the moment it was drawn in. The period of time required by a plant to renew all the air it has abſorbed, he found to be leſs than half an hour by day and by night. This laſt aſſertion, which he has demonſtrated by facts, will, he ſuppoſes, perhaps be looked upon by critical minds as ſomewhat paradoxical, as it ſeems difficult to conceive that the ſame organized body can, at the ſame time, inhale and evaporate from the ſame ſurface the ſame fluid; but this double phenomenon being continually performed in all parts of living animals, the difficulty of underſtanding it vaniſhes

of

of courſe. Though the moſt part of animal plants which afford good nouriſhment for men, ſuch as wheat, rye, maize, &c. will grow in poor ſoils, yet they do not become thriving in a luxuriant way, but in what is called a rich or well manured ſoil. Thoſe plants have a quick growth, when aſſiſted by heat and the ſun's light, come very ſoon to their term, or to the act of propagating their ſpecies, or of producing ſeed; which being come to perfection, the vital power of the plant is exhauſted, and it dies. Theſe plants being of a tender ſtructure, and generally not ſpreading their roots deep in the ground, require the niceſt attention in preparing the ſoil, ſo that the roots may find the leaſt reſiſtance in ſpreading, and alſo as much nouriſhment ready prepared for being abſorbed by the roots as the plants want to become vigorous, and no more; as it is well known that too much manure, as well as too little, will prevent the plants from thriving. By want of manure, the plant may, he thinks, be conſidered as ſtarved, and by too much, as choaked with food. This may perhaps be conſidered, it is conceived, as ſomewhat analogous to a chicken which will lay no eggs, or very few, by feeding it too little, or too much; and it may be with plants, perhaps as it is with animals, that too much food may be hurtful to both.

But, if carbon or coal be really the genuine food of plants, it ſeems to him doubtful whether the brown mud remaining after an infuſion of dung is evaporated, be real coal, before it has undergone an ignition. It ought rather, it is thought, to be called an extract, and may again be diffuſed through water, or diſſolved, as it was before the evaporation; but when it is burned into real coal, it is become almoſt totally inſoluble in water, as all charcoal is generally well known to be. Charcoal is not only inſoluble, but almoſt unalterable, incorruptible, poſſeſſing, only when newly ignited, an antiſeptic power, which it recovers again by a new ignition; and he cannot help ſtill doubting whether real coal, reduced even to impalpable powder, poſſeſſes any manifeſt quality by which it deſerves to be arranged among manures. The juſtly celebrated Mr. Arthur Young, having put this powder to the trial, found it had no beneficial effect at all on vegetation. Though there is no doubt but that vegetables draw in by their roots a good deal of food, yet he thinks the principal buſineſs of feeding is carried on by the leaves in the atmoſphere. Beſides the fact of M. Du Hamel deſcribed above, there are ſeveral other conſiderations which ſeem to give ſtrength to this aſſertion. Many European trees, when ſtripped at once of all their leaves, will die. (Trees in very hot climates ſuffer the loſs of their leaves by the ſcorching ſun for a time in dry weather, without periſhing.) Doctor Ingenhouſz was preſent at the following fact: the ſulphurous ſmoke from burning a few pounds of antimony mixed with nitre was accidentally driven by the wind upon a very thriving large pear-tree, full of pears half ripe; next day he found all the leaves and pears fallen off, and the tree irrecoverably dead. A plant placed under a bell, with its root in a phial full of water, will, he ſays, die when the bell is exhauſted by an air pump: it will equally periſh, if, inſtead of reſpirable air, it be immerſed in any air unfit for breathing animals. If the roots were the chief organs of feeding plants, their life might, he ſuppoſes, be ſupported in any of thoſe airs, principally ſuch as poſſeſs no acrimonious ingredient, ſuch as pure azote; but pure azote will kill a living plant, and prevent ſeeds from vegetation. Reſpirable air, moderately warm, is alone ſufficient to make a plant vegetate, without any light. He found even that ſeeds are hurt by a ſtrong light, grow ſlowly, and are often killed before the two lobes are become leaves, and their plumula and root are formed; and that, if they ſurvive the action of light, they remain commonly but weak or deformed plants. This ſhews, it is ſuppoſed, that in agriculture almoſt all ſeeds not covered will periſh, when the ſun ſhines upon them at the time of their beginning to ſwell or vegetate. His experiments have, he thinks, proved ſufficiently that ſuch ſeeds or embryo plants periſh by the light only, (which is inſupportable to all very young plants, as well as plants weakened and ſickened by tranſplantation,) and not by the heat of the ſun, or by want of moiſture. When a plant is reared up in the dark, either under the ground, or in a dark or ſhaded open place, to a certain degree of ſtrength, light becomes more and more beneficial to it: not however for its advancing in ſize, but for acquiring ſtrength, getting a lively green colour, and for its becoming fit for propagating its ſpecies, which propagation will not ſucceed without ſufficient ſun-ſhine, or at leaſt day-light, and a due degree of heat; that is to ſay, the heat of the air, and by no means the heat of the ſoil; which laſt, though very beneficial to ſome plants, is rather hurtful to ſeveral: and indeed the ground being kept moiſt by watering, is always kept cool by the continual evaporation, and yet plants in general thrive very well in moiſt ground, though always kept cool. Trees in a foreſt ſpread their principal roots to ſuch a depth as the heat of the atmoſphere can never reach; their roots are, winter and ſummer, in an uniform temperature of 50—52 degrees of Fahrenheit's thermometer. This ſhews, it is conceived, that the vegetation of trees, as is that of almoſt all plants, being ſtopped, or nearly ſo, during the winter, is revived by the heat of the atmoſphere alone, without any regard to the heat of the ſoil, which is ſcarcely ſubject to any alteration, but at the ſurface. The heat of the atmoſphere alone, it is thought, ſets the juices of trees into motion, which motion ſets, by propagation alſo, the juices of the roots into the ſame motion: thus the juices drawn from the roots upwards, empty the filaments and ſuckers, which by this motion upwards naturally become powerfully abſorbent, without any degree of heat being more neceſſary for this abſorption or attraction than is required for the ſuction of an ordinary pump. Boyle or Hales, (if he recollects well,) applying a glaſs tube to the trunk of a vine cut off in the ſpring, collected a very great quantity of juice pumped up by the roots; which motion of the fluids in vegetables depends greatly upon their irritability, according to M. Van Marum; which ſeems to be the more probable, as an electrical exploſion, directed through a plant, ſuch as euphorbia, ſtops immediately all motion in its juices by extinguiſhing the irritability. The roots thus abſorbing the moiſture preſented to their ſuckers, take in of courſe all ſalts, earth, metallic ſubſtances, &c. that can be diſſolved in water, or in the ſaline matter to be found in almoſt all waters. This ſolvent is found to be, for the moſt part, fixed air. Though we find ſome of theſe ſalts, with all their characteriſtic qualities, in ſome plants growing in a ſoil impregnated with them, as are many plants growing near the ſea-ſhore which are full of ſea ſalt; yet it is not leſs true, that moſt part of the ingredients imbibed by the roots, as well as by the leaves, trunks, and branches, undergo almoſt a total change in the organs of the plants, even ſo far as to produce in one plant a wholeſome food, and in another, its next neighbour, a true poiſon. But as he has proved before, that the atmoſphere alone can furniſh ſome plants all that is wanting for all their functions, we ought not to look too anxiouſly among rubbiſh or dung, for the true and natural food of vegetables, though in thoſe ſubſtances a greater quantity of this food is at hand, ready prepared, and partly imbibed in the form of carbonic acid,

mucilage,

mucilage, oily and faline matter, by which the plant is enabled to provide food for throwing out and nourifhing more branches, flowers, and fruits. He thinks it difficult to conceive how a large tree finds, during centuries, nourifhment on the fame fpot, on the fuppofition of M. Haffenfratz, that its principal food is coal; and that this coal is not derived from the decompofition of the carbonic acid (of which coal conftitutes nearly one-third, according to M. Lavoifier $\frac{28}{100}$). That gentleman admits doctor Ingenhoufz's difcovery as well founded, that plants produce carbonic acid in the dark; and that roots, being always deprived of day-light, are of courfe inceffantly occupied with this bufinefs. There exifts every where in the foil common air; and common air alone is, the doctor fays, fufficient to furnifh, as he has proved before, carbonic acid even without plants. Thus there is no difficulty in tracing the fource of this coal, and of conceiving how the large trees find, during centuries, that immenfe quantity of food it requires for its maintenance, growth, and abundant production of fruit or feed, all which is certainly derived in part from the foil; but he ftill believes chiefly from the atmofphere, by means of the leaves abforbing and decompofing the air in contact with them.

It is ftated, that the tranfmutation of common air into different folid bodies, fuch as plants, is a very ancient doctrine. Pythagoras and Epicurus took it, the writer fays, for an undoubted fact; and Lucretius, who has adorned his poem "De Rerum Natura" with this doctrine, afferts that air changes continually into different other fubftances, and that thefe are again decompofed into air, which afterward returns again into the compofition of the different bodies; and that if this inceffant rotation did not exift, every thing in this world would have been changed into air, which, of courfe, would have been at laft the only fubftance exifting. Anaximenes alfo afferted that all bodies are made of air, or formed of aerial matters.

It is fuggefted that in a preceding page the doctor hinted at a new theory of a curious fact, *viz.* that plants accelerate their growth in the dark, and advance the leaft in the middle of the day (which is an obfervation of M. Gardini). Though this theory may perhaps be erroneous, yet, as it is fupported on a real fact, he afferts further that plants changing in the dark more refpirable air into carbonic acid than they can digeft, they throw out a large quantity of it, and thus render the air in contact with them lefs refpirable; and that in the day they abforb, with the atmofpheric air fo much matter of heat and light, or caloric furnifhed by the fun, that they cannot digeft it all, and therefore throw it out as fuperfluous, combined with the oxygen which has thus acquired the nature of vital air; which vital air, though not yet obtained by plants in its greateft purity, is however in itfelf full as pure as that which we obtain from the beft manganefe, or any other ingredient. In a letter to fir John Sinclair, in 1794, he quoted as a proof of carbonic acid being the principal food of plants, the fact he difcovered, that the wonderful apparatus which a plant produces when it is occupied with the propagation of its fpecies, *viz.* the flower, is inceffantly producing carbonic acid. By this obfervation we may, it is thought, be led to the knowledge of the true natural food of vegetables; and it may be faid as a further illuftration, that if we were defirous to know what is the natural food of fome particular animals, one of the fureft methods to find it out, would be to obferve what kind of nourifhment the parents bear to their young. Thus we fhould find that a pigeon is beft fed by grains, and a fwallow by infects. By a fimilar conclufio , it is inferred that the true, or principal aliment of plants is refpirable air decompofed. By examining the air thus decompofed, he found it confifted of two fubftances, *viz.* of fixed air or carbonic acid gas, and phlogifticated air, or azote; but as carbonic acid contains two diftinct fubftances, *viz.* coal or carbon, and oxygen, it may be queftioned which ingredient of the two is the real food we look for. M. Haffenfratz thinks it is principally coal: though his opinion is that the plant does not derive the coal from the carbonic acid, but from the foil or dung. The doctor is, however, much inclined to think that both thefe fubftances ferve as food; and he is moreover inclined to believe that the azote alfo enters the plant, and has alfo fome fhare in feeding it. One of his reafons for thinking fo is, that plants abforb continually the whole of the atmofpheric air, and that in feparating this fluid by decompofition into its conftituent parts, they throw out that part of it which they cannot fully digeft at the time it is produced, *viz.* at night, the azote and the carbonic acid difengaged one from another, or only mechanically, not chemically, as formerly they were mixed, and in the fun-fhine the oxygen almoft alone, the carbon and the azote remaining within the plant at that time. Though he thinks it probable that the azote enters, in fome way or other, into the compofition of plants, yet he fuppofes it is not abfolutely neceffary for a plant, as a plant thrives admirably well without it, *viz.* in pure oxygen. It is true, however, that plants alfo die in pure carbonic acid; but in this cafe the plant may be perhaps confidered as if it were choaked with it. He, however, acknowledges very readily, that the juft mentioned theory has not all the clearnefs he could wifh to give it. But the facts quoted to fupport it, though contradicted during twelve years, are now, it is afferted, admitted, even by thofe who have been the chief oppofers of the doctrine.

The writings of the late Dr. Darwin have furnifhed a variety of ufeful and interefting facts and obfervations on the nature of the food of plants, and the general economy of vegetables. In the analogy which he has drawn between the manner in which animals and vegetables are nourifhed and fupported, there is much that renders the theory of the food of plants more clear and intelligible. It is ftated, that the various fubftances which conftitute animal bodies, or which are found in the cavities of them, are compofed from fimpler elements by the procefs of digeftion, and fanguification, and fecretion; for it is well known that even milk, which fo much refembles the chyle of animals, is not abforbed by the lacteals, without its being previoufly coagulated, and again diffolved in the ftomach by the power of digeftion. Hence it happens, that the chyle of all animals, and from every kind of food which they take into their ftomachs, is very fimilar; and, like milk, confifts of water, fugar, mucilage, and oil; the laft of which, not being foluble in water, but only mifcible with it, gives its opaque white colour. But that though the chyle from different kinds of aliment is fo fimilar, that all the various conftituent parts of animal bodies are ultimately produced from the chyle by fanguification and fecretion; yet it happens that fome kinds of aliment poffefs a greater quantity of thofe particles, which make chyle, than other kinds of aliment; fuch materials, for inftance, as already contain much fugar, mucilage, and oil, which exift in chyle; there may, it is fuppofed, be other materials, which are invifible from their perfect folution in water, either alone, or when converted into acids by the addition of oxygen; as carbon, phofphorus, calcareous earth, marine and ammoniacal falts; though it is more probable that the two laft are formed and fecreted by animal proceffes, as well as fe-

lected

lected by the abforbent roots of vegetables, as they are more compounded bodies than the former kinds.

And it is afferted that fimilar to this chyle of animals is the fap-juice, which is abforbed from the earth by the roots of plants, conftitutes their nourifhment, and confifts of water, fugar, and mucilage, with other tranfparent folutions, as of carbon, phofphorus, and calcareous earth. But though it has been proved by the experiments of fome philofophers, that vegetables can extract or compofe all thefe fubftances from air and water alone, yet fome materials contribute more to the production of this vegetable chyle or fap-juice than others, fuch as the recrements of dead vegetable and animal fubftances in general.

The doctor therefore obferves, that if any one fhould afk what is the food of animals? he fhould anfwer, that in the moft early ftate of animal life the embryo lives on a mucilaginous fluid with which it is furrounded, whether in the egg or womb: that in its infant ftate the young animal is fuftained by milk, which its ftomach converts into chyle or nourifhment: and that in their adult ftate, animals are fuftained by other vegetable or animal fubftances taken into their ftomachs, which are there converted into chyle, partly by a chemical and partly by an animal procefs; as by a mixture of gaftric juice with water and heat, fome of thefe recrements of organic nature are decompofed, either into their fimpler component parts, or fometimes even into their elements; while other parts of them are only rendered foluble or mifcible with water, and are then drunk up by the abforbents of the ftomach and inteftines. In this procefs of digeftion much fugar is produced, which is probably immediately felected and drunk up by the numerous mouths of the lacteals or lymphatics, to which it is prefented by the vermicular or periftaltic motions of the ftomach and inteftines. And as this ready felection and abforption of the fugar, as foon as it is formed, prevents it from paffing into the vinous or acetous fermentation; it is probable, that from the want of fuch a means of feparating faccharine matter, as foon as it is formed, chemiftry has not yet been able to produce fugar from its elements without the affiftance of animal digeftion, or vegetable germination, as in the procefs of malting.

It is further remarked, that in this procefs of digeftion, it is believed a great part of the water, fugar, mucilage, and oil, which exift in vegetable and animal recrements, are not decompofed into their elements, but abforbed by being foluble or mifcible with water; the carbon, the phofphorus, and the hydrogen, are alfo, it is fuppofed, diffolved in the other fluids by means of oxygen, and form a part of the chyle, without their being converted into gafes; for, when this happens to any excefs, in refpect to carbon, it efcapes from the ftomach in eructations; and the fame occurs to the inflammable air or hydrogen, if a part of the water becomes decompofed in the inteftines; which, if it be not abforbed by its folution in other fluids, but acquires a gafeous ftate, is liable to efcape below; though both thefe gafes feem occafionally to revert to a fluid ftate, from their aerial one in the ftomach or inteftines, and to be then capable of being abforbed by the lacteals or lymphatics of the fyftem.

It is afked what then is the food of vegetables? The embryon plant in the feed or fruit is furrounded with faccharine, mucilaginous, and oily materials, like the animal fœtus in the egg or uterus, which it abforbs and converts into nutriment; while the embryon buds of deciduous trees, which is another infantine ftate of vegetables, are fupplied with a faccharine and mucilaginous juice, prepared for them at the time of their production, and depofited in the roots or fap-wood of their parent-trees, as in the vine, maple, and birch; which faccharine matter is foluble and mifcible with the water of the furrounding earth in the fubfequent fpring, and is forcibly abforbed by their root-veffels, and expands their nafcent foliage or leaves.

It is therefore concluded, that in their infantine ftate, there is a wonderful analogy between plants and animals; and it is particularly curious to obferve in the procefs of converting barley into malt, by the germination of the feed, that the meal of the barley is, in part, converted into fugar by the digeftion of the young plant, exactly as in the animal ftomach. The wonderful effect of vegetable digeftion in producing fugar may be deduced from the great product of the fugar-cane, and of the maple-tree in America; and the wonderful effect of animal digeftion in producing fugar, appears in patients who labour under diabetic affections.

It is now proper to come to the confideration of the food of adult plants; and in this confifts the great and effential difference between the nutritive proceffes of animals and vegetables. The former are poffeffed of a ftomach, by which they can, in a few hours, decompofe the tender parts of vegetable and animal fubftances by a chemical procefs within themfelves, conducted in the heat of ninety-eight degrees, with a due quantity of water, and a perpetual agitation of the ingredients; which both mixes them and applies them to the mouths of the abforbent veffels which furround them. Whereas a vegetable being, having no ftomach, is neceffitated to wait for the fpontaneous decompofition of animal or vegetable recrements; which is indeed continually going on in thofe foils and climates, and in thofe feafons of the year which are moft friendly to vegetation; but is in other fituations, and in other feafons, a flow procefs in a degree of heat as low as 40° of Fahrenheit, (in which the rein-deer mofs, *mofchus rangiferinus*, vegetates beneath the fnow in Siberia,) and often without an adapted quantity of water to give a due fluidity, or any mechanical locomotion to prefent them to the abforbent mouths of their roots: or in ftill worfe fituations, adult vegetables are neceffitated ftill more flowly to acquire or produce their nutritive juices from the fimpler elements of air and water, with perhaps the folutions of carbonic acid and calcareous earth, and perhaps of fome other matters, with which one or more of them abound, or are faturated. See Air, Water, Carbonic *Acid Gas*, and Calcareous *Earth*.

It is however remarked, that M. Haffenfratz found that the vegetation of thofe plants was imperfect which had not been fuffered to grow in contact with the earth; as they never arrived at fuch maturity as to produce fruit, and were found, on analyfis, to contain a lefs portion of carbon than other plants of the fame kind. The experiments were tried on hyacinths, kidney-beans, and creffes. Hence the doctor thinks the other great difference which exifts between thefe two extenfive kingdoms of nature is, that the larger and warmer blooded animals certainly, and it is fuppofed all the tribes of infects, and of colder-blooded creatures alfo, cannot exift long on air and water alone, except in their ftate of hibernal torpor. The neareft approach to this is, however, it is thought, feen in fome fevers, where water alone has been taken for a week or two, and yet the patient has recovered: and there is a well attefted account of a numerous caravan, which having loft their route or their provifions, are affirmed to have lived fome weeks on gum-arabic and water, without any other fubftance.

But vegetables, on the contrary, as fuggefted above, can, it is conceived, exift, though in a feebler ftate, on water and air alone, with the carbonic acid, and perhaps other invifible folvents;

folvents, which thefe elements unavoidably contain. This is fuppofed to be owing to the low degree of heat which they produce internally, and to the flow circulation of their blood, or fap-juice; from both which circumftances lefs nutriment is expended, as is the cafe by animals which fleep during the winter feafon in their habitations, or other places.

It is therefore fuggefted, that, for the purpofe of fupplying adult vegetables with nourifhment, it fhould firft be confidered what kinds of matter are moft prevalent or moft neceffary in their compofition. Secondly, what of thefe fubftances they can abforb without previous decompofition. And laftly, how to expedite the decompofition of vegetable and animal fubftances on or in the foil, like the digeftive proceffes in the ftomachs of animals; we may, in this way, it is fuppofed, become acquainted with the fources and the management of manures as the food of plants. And it is not improbable but that their ufes and applications on lands may be regulated and conducted with greater certainty and fuccefs. See MANURE, and VEGETATION.

FOOL, according to Mr. Locke, is one who makes falfe conclufions from right principles; by which he is diftinguifhed from a madman. See FOLLY.

Dr. Willis relates, that, upon diffecting a fool, the principal differences found between him and a man of fenfe, were, that the brain was fmaller; and that the cervical plexus, formed of the intercoftal nerve, whereby the correfpondence between the brain and heart is effected, was lefs, and fent forth fewer branches to the heart, &c. Nervor. Defcript. & Uf. cap. 26.

FOOL'S PARSLEY, in *Botany* See ÆTHUSA.

FOOL'S *Stones*. See ORCHIS.

FOOLADO, in *Geography*, a kingdom of Africa, on the banks of the Senegal river, between the 5th and 7th degrees of W. longitude, and the 12th and 14th of N. latitude. This is faid to be the original country of the Foulahs, but they poffefs many other kingdoms at a great diftance from each other. See FOULAHS.

FOOLCHOKY, a town of Bengal; 15 miles N.E. of Maulda.

FOOLICONDA, a town of Africa, in Yani, on the N. fide of the Gambia; 60 miles N.W. of Pifania. N. lat. 14° 3'. W. long. 14° 25'.

FOOLOMANICA, a town of Africa, in Foolado. N. lat. 13° 10'. W. long. 6° 2'.

FOOLOOTIA, one of the fmaller Friendly iflands; 24 miles N. of Annamooka.

FOOLPARAS, a town of Hindooftan, in Bahar. N. lat. 26° 19'. E. long. 86° 41'.

FOOLPOUR, a town of Hindooftan; 16 miles N.W. of Benares.

FOOSHT, a fmall ifland of the Red fea, of an irregular form, about five miles from N. to S. and about nine in circumference. On the fouth it is low and fandy, and on the north is a black hill or cape that may be feen at the diftance of four leagues. It has two watering-places; one on the E. of the ifland, the other on the W. When the water is firft taken up, it is muddy, and appears as black as ink: but when it has fettled two or three days, it becomes excellent. The wells are taken care of by a Marabout or faint, to whom this office belongs. This ifland is covered with a kind of bent grafs, which, for want of rain, and by the conftant feeding of the few goats that are kept here, is prevented from growing to any height. The end of the ifland founds very hollow underneath, like Solfaterra near Naples; and as quantities of pumice-ftones were found here, there is reafon for prefuming that the black hill was once a volcano. It abounds in good fifh; fome of which, though not the beft for food, exhibited very beautiful colours. The inhabitants are poor fifhermen of a blackifh colour, and go naked, except that they wear a rag about their waift. Their faces are neither ftained nor painted. The fifh they catch is carried to Loheia, and exchanged for dora and Indian corn, as they have no bread but what they procure in this way. They have here a flat fifh with a long tail, the fkin of which is a fpecies of fhagreen, with which are made the handles of knives and fwords. Pearls too are found here; but they are neither large nor of a good water. The ifland abounds with beautiful fhell-fifh, and fpunges of the common kind are collected along the coaft. The town confifts of about 30 huts, built with faggots of bent grafs or fpartum, and thefe are fupported within by a few fticks, and thatched with the grafs of which they are built. At the diftance of 4 miles, E.N.E. is Baccalun, an ifland, low, long, and as broad as Foofht, inhabited by fifhermen; without water in fummer, which is brought from Foofht; but in winter rain water is preferved in cifterns. Thefe were built in ancient times, when this was a place of importance for the fifhing of pearls, and they are at this day in perfect repair. Foofht is the moft convenient watering-place for fhips bound up the channel from Jibbel-Teir; and the weftern watering place is moft eligible. N. lat. 15° 59' 43''. E. long. 42° 27'. Bruce's Travels, vol. i.

FOOT, a part of the body of moft animals, whereon they ftand, walk, &c.

Animals are diftinguifhed, with refpect to the number of feet, into bipedes, *q. d. two-footed*; fuch are men and birds; quadrupeds, *q. d. four-footed*; fuch are moft land animals: and multipedes, *q. d. many-footed*; as infects. The reptile kind, as ferpents, &c. have no feet.

Galen has feveral good obfervations on the wife adjuftment of the number of feet in men and other animals, in his book De Ufu Part. lib. iii.

The fore-feet of the mole are admirably formed to dig, and fcratch up the earth, and make way for its head, &c.; in water-fowls, the legs and feet are excellently adapted to their refpective occafions, and manners of living; in fuch as are to wade in rivers, the legs are long and bare of feathers a good way above the knee; their toes alfo are broad; and in fuch as bear the name of *mudfuckers*, two of the toes are fomewhat alated, that they may not eafily fink in walking upon boggy places.

Others, which are to fwim, are whole-footed; *i. e.* have their toes webbed together: as in the goofe, duck, &c. and it is pretty enough to obferve, how artfully thefe will gather up their toes and feet, when they withdraw their legs, or go to take their ftroke in fwimming; and again expand, or open, the whole foot, when they prefs upon, or drive themfelves forward in the water.

FOOT, in *Anatomy*. See EXTREMITIES.

FOOT, *Bathing of*. See PEDILUVIUM.

FOOT, *Bleeding in the*. See BLEEDING.

FOOT, *Diftortion of*. *Club-foot* is the name given to fuch deformity and diftortion of the foot as prove prejudicial to the functions of the part.

Children are fometimes born with their feet thus diftorted, and fometimes this difagreeable fpecies of deformity comes on after birth, being occafioned by a bad habit, which fome nurfes have of making children ftand and attempt to walk at too early a period of life.

In certain fubjects, we find the legs themfelves diftorted; in fome, the knees are deformed, while in others, the fault lies in the tarfus and ankle-joint, in which cafe, the feet are twifted either inward or outward.

The Latins used to confer the epithet *vari* on patients afflicted with a preternatural inclination of the feet inward, and the expression *valgi* was applied to such persons as had their feet turned too much outward.

When the foot is distorted inwards, which is most common, the sole assumes more or less a perpendicular position, and is occasionally turned quite backward, the patient being compelled to walk on the external edge of the foot.

The deformity sometimes affects only one foot, sometimes both. The following external appearances are observable in the mis-shapen part. The foot is bent from before backward, so that the instep seems very much arched, and the sole of course considerably excavated in the transverse direction. In some subjects the metatarsal bones incline towards each other, whereby a longitudinal hollow is also occasioned in the sole of the foot. The great toe is, at the same time, bent inward towards the os calcis, while this latter is also approximated to the former part. Hence it is obvious, that the internal edge of the sole of the foot must be extremely concave, and the external one particularly convex.

As the patient can only walk upon the outer edge of the foot, the surface of the sole is soft and smooth; but the projecting external part of the foot (that is to say, the skin covering the metatarsal bone of the little toe, and the os cuboides) is much thickened and indurated. On comparison with a sound foot, the tibia seems to incline obliquely from behind forward in its descent to the astragalus; the heel is less prominent behind; and the muscles of the calf are shortened.

Little, or nothing, of the internal malleolus can be felt, while the external one forms an extraordinary projection. The skin of the inner ankle is also considerably on the stretch.

The leg and thigh, compared with the rest of the limbs, are always in an emaciated state. In new-born children this circumstance is not observable. The knee is turned outward as well as the whole thigh, while the ham is rolled inward.

The bones and muscles are still more remarkably altered. On examination, Camper found the neck of the astragalus twisted, the fore part of the foot being drawn inward by the action of the tibialis anticus and posticus muscles. The peronei muscles consequently lose their strength, and no longer retain the power of drawing the foot outward. The astragalus consequently becomes more and more displaced, and pushed in the external direction. The os calcis itself becomes approximated to the bones of the tarsus by the action of the abductor and flexor brevis pollicis pedis. The heel is considerably retracted, in consequence of the tibialis anticus and other muscles, from their altered condition, having lost all effectual power of counteracting the muscles of the calf.

Brückner, a German practitioner, has referred the original defect to the os naviculare; but without having made any examinations by dissection. This bone is said to be forced more inward, and to be so changed in position, that its lower surface inclines obliquely inward, and the knob on its inside obliquely upward. The os cuboides is turned obliquely outward, and, when displaced very considerably, it slips somewhat away from the anterior end of the os calcis, and from the os cuneiforme externum.

The rest of the bones must all of necessity suffer, more or less, from the foregoing deviations from nature, and the os calcis, in particular, becomes considerably less prominent backward.

The following account is given by Clossius of the examination of two club-feet.

In the left foot, which was only slightly affected, nothing in the least unnatural was observed betwixt the tibia and astragalus. The malleolus internus was of a proper length, and the os naviculare was in every respect naturally connected with the astragalus, and first cuneiform bone. It was only remarked that the foot, in consequence of the great convexity of the os naviculare, had too abrupt a slope at its outer edge, which was inclined towards the sole; that the third cuneiform bone was somewhat separated from the os naviculare, and the os cuboides a little removed inward at its connection with the os calcis. From these circumstances, it was inferred, that the tibialis posticus muscle had acted so powerfully on the third cuneiform and the cuboid bone as to have brought towards the sole the outer edge of the foot, nearer to the internal margin of the same.

The most considerable deformity was in the right foot.

The narrow part of the astragalus was twisted inward and downward, and on the inside it and the head of the bone were compressed together. The surface, articulated with the tibia, was pushed so much obliquely inward, that a considerable portion of it in front was not at all opposed to the tibia, while the back part of the latter had a new articular surface formed on it. The side of the articular surface of the astragalus, and the malleolus externus connected with it, were both thrown more forward, out of their natural situation. The part of the astragalus to which the malleolus internus is joined, was with some of this latter process absorbed.

The tibia extended very obliquely from above downward, and from behind forward to the os calcis, or else the protuberance of the latter was drawn upward, so as to appear shortened.

The whole of the astragalus being distorted inward, it follows, that its head of course projected externally, and formed a prominence on the back of the foot.

The os naviculare was rightly connected with the three cuneiform bones, and was not in the least mis-shapen.

The back of the foot was also remarkably convex, and the os calcis considerably bent forward towards the great toe. As the inside of the head of the astragalus was absorbed, and its neck displaced inward, the os naviculare was in close contact with the remains of the malleolus internus. Neither the os naviculare, nor the os cuboides, was at all narrower than the corresponding bone in the opposite limb, so that the great toe did not incline preternaturally towards the heel, though this may be the case when the deformity is very considerable.

Clossius is of opinion that the distortion originated as follows: the tibialis posticus muscle had approximated the outer edge of the foot to the inner one, and consequently had occasioned a longitudinal excavation in the sole. The fibres of the tendon of the same muscle, which ran in a straight direction to be implanted into the cuboid, third cuneiform, and navicular bones, had acquired the power of strongly turning the foot inward, and forcibly extending it. Hence, the sole was rendered very hollow transversely, and the instep particularly convex; hence the end of the foot pointed downward considerably, while the os calcis was drawn up very high; and hence arose the distortion of the astragalus, and the palpable absorption of certain portions of this bone.

When the head and neck of the astragalus are diminished, the abductor pollicis pedis can act with great effect on the projecting

projecting lever of the os calcis, fo as to diftort this bone inward and upward, and bring the great toe nearer to it.

The caufe of the diftortion is not always to be imputed, as fome have imagined, to a partial luxation of the ankle-joint; but to a change in the form of the bones, more efpecially of the aftragalus.

In confequence of the diftortion of the foot, the mufcles which are fituated in the fole, and run from behind forward, become confiderably fhortened, fo that the toes bend on every attempt to put the foot in a ftraight pofition. That the peronei mufcles muft be confiderably on the ftretch muft be manifeft to every body.

Camper thought the reafon of the leg's being emaciated quite inexplicable, as there is no defect in the functions of the digeftive organs, and no preffure operating on the part. Cloffius fuggefts, as an explanation of the caufe of the preceding change, the unnatural pofition, the tenfion, and the inactive ftate of the mufcles; for club-footed perfons neither move their ankle, nor their knee-joints, but bring their feet forward in a circular manner, with ftiff knees and a limping gait. The feet are not approximated in walking, and the thigh and knee become confiderably turned outward. Alfo, fince fuch perfons tread upon the outer edge of the foot, the peronei mufcles muft be continually more and more weakened, and the deformity increafed.

Camper has imputed the occafional caufe of the diftortion to want of room in the uterus. However, other authors maintain, that this caufe is by no means eftablifhed, fince, during the five firft months of geftation, the child can move very freely in the womb, and as there is even at a later period no particular deficiency of fpace. Other authors have conceived that a more likely caufe is the foot's being propelled by fome incident or another into a preternatural pofition in the womb, and remaining in fuch condition.

It is curious however (if what fome writers allege be true), that the club-foot fhould occafionally prevail in particular families, and feem to be an hereditary affection.

The deformity may alfo come on after birth, when children, either from inclination, or in confequence of ulcers on the fole, accuftom themfelves to tread upon the outer edge of the foot.

The cure is the more eafy of accomplifhment, the younger the child is, and hence it is a rule to begin the treatment at an early period. The affliction, however, has been removed in children thirteen years of age.

The firft indication in the treatment is to make the contracted tendons, fafciæ, and mufcles fupple again. Surgical writers, with this view, recommend the employment of warm bathing, which is to be repeated every day. They alfo advife the foot to be rubbed with oleaginous applications, or bathed in warm oil, and rubbed with the fame. The frictions are to be made as far upward as the ham, and the limb is likewife to be bathed to this extent.

After keeping the foot immerfed for a certain time, an endeavour is to be made to ftraighten it, and bring it more into a natural pofition. This trial is to be repeated feveral times in the courfe of the day, and particular care muft be taken to deprefs the heel.

It is to be underftood that the attempts are to be made with great care and perfeverance, and that the child muft be entirely prohibited from putting the affected foot to the ground.

Before having recourfe to the employment of machines for the purpofe of keeping the foot in the defired pofition, it is always worth while to try what fimple bandages will effect; for machines can only be ufed on fuch children as are fomewhat advanced in life, and the deformity is invariably the more eafy of removal, the fewer years the patient has attained.

Some furgeons advife the ufe of a bandage, applied all over the part, and compofed of a fine towel or piece of muflin. The advantage of fuch a contrivance is, that it does not cut the limb too much. The knot is to be made on the middle of the inftep, fo as that the bandage may ftrongly draw the toes outward and upward, and thus lower the heel.

Some degree of benefit may be expected from the ufe of this kind of bandage in all thofe cafes in which the diftortion is not too confiderable; and the os calcis not too much bent.

When the child begins to walk, it always turns its toes inwards, and does not bend its knee; confequently the gait is attended with a motion of the body from one fide to the other, the child treads on the point of its foot, and the heel is drawn up.

Due care at length makes all thefe defects difappear. The toes muft always be kept inclined outward, and the child muft be taught to bend its knee without elevating the heel.

At laft, the young patient fhould wear half-boots, the outer edge of which muft be higher than the inner one. They are alfo to be made without heels.

With regard to machines, we fhall only obferve that fome practitioners confine the foot in a natural pofture with leg-irons of different conftructions. Some maintain the part in a right pofition, with boxes of tin, or copper, or with ftrong leather boots. Others ufe a more complicated apparatus, which confifts of metal fhoes, in which the foot is confined, and of a wheel fixed by a ratchet, for the purpofe of keeping the toes turned outward.

The inconveniences of fuch methods are, that when the machines do not allow room for the ankle to move, the joint becomes ftiff, and that when there is room, a due degree of fupport is not afforded. Mr. Sheldrake has ingenioufly obviated thefe difficulties, by devifing a kind of fpring, which is the operating power, and which is fo advantageoufly made, that when the limb is moved, the apparatus acts with increafed force. See Cloffius über die Krankheiten der Knochen, Tübingen, 1798. Sheldrake on the Club-foot.

Foot, *Fracture of*. See Fracture.

Foot, *Luxation of*. See Luxation.

Foot, in the *Manege*, is the extremity of a horfe's leg, from the coronet to the lower part of the hoof. The four feet are diftinguifhed by four different names; the two fore-feet are by fome called the hands of a horfe; but that term is in difufe, the common expreffion being the far fore-foot, to denote the right foot before; and the near fore-foot, the ftirrup-foot, and the bridle hand-foot, to denote the left foot before.

Of the two hinder feet, the right is called the far hinder-foot; and when fpears were ufed, it was called the fpear-foot, becaufe in refting the fpear the focket of it anfwered the right hinder-foot. The left hind foot is called the near foot behind. See *Veterinary* Anatomy.

Foot-*derobé*. A horfe's foot has this appellation when it is worn and wafted by going without fhoes, fo that for want of a hoof, it is a hard matter to fhoe him.

A horfe's foot is faid to be worn and wafted, called in French *ufé*, when he has but little hoof, and not enough for fhoeing.

Foot, *to gallop upon a good*, or put a horfe upon a good foot,

foot, called in French *sur le bon pied*. See *False* GALLOP.

FOOT, *Fat*. A horse is said to have a fat foot, when the hoof is so thin and weak, that unless the nails be driven very short, he runs the risk of being pricked in shoeing. The English horses are very subject to this disorder.

FOOT-*soldier*, implies that class of military persons who are included in the roll of privates in marching regiments, and in all corps which act on foot, in contra-distinction to such as are mounted, and come under the designation of *horse-soldiers*, more commonly called *cavalry*.

No recruit ought to be passed into any regiment of foot, whose stature should be under five feet six inches, or whose form, health, and senses might appear to be in any instance defective. In time of war, indeed, some little relaxation from that strictness which ought to obtain where candidates are abundant, must be admitted; but such should be under certain circumstances only. It is a fact that, at the termination of a war, when many regiments are disbanded, those who return to their homes are rarely able to obtain a livelihood, owing to their having been reduced greatly, in regard to their physical powers, by the fatigues and hardships attendant upon a profession to which their constitutions were unequal, and wherein they would not have been admitted, but from the absolute necessity existing during times of emergency; when any human being becomes acceptable! The services demanded of a foot-soldier are severe indeed; especially in the regiments of artillery. In that highly respectable corps, much circumspection is used in the selection of recruits, as well as in their subsequent training; it being peremptorily necessary, that every individual, besides possessing the proper stature, form, and constitution, should be active and intelligent, since on the presence of mind, ingenuity, and professional skill of the artillerist, though of the lowest ranks, the most important consequences have often been found to depend.

The pay of a foot-soldier corresponds with the rank of the corps, or branch of the service, in which he may serve. In the artillery it amounts to 1*s*. $3\frac{1}{4}$*d*. per diem; in the foot-guards to 1*s*. 1*d*.; and in regiments of the line to 1*s*. But in addition to this, they are served with bread, in a very liberal proportion, and experience many little indulgences, especially in being supplied by publicans, &c. on whom they may be billetted, with beer and victuals at fixed rates, such as occasion their room, rather than their company, to be a desideratum with their hosts.

Formerly every foot-soldier was armed cap-a-pee; but it being soon perceived that one efficient implement, well handled, was far superior to that variety which at least encumbered, if it did not distract the attention of the individual bearing the motley armour, the weapons used by foot-soldiers are now confined to the musket and bayonet; which may not improperly be considered as but one. The only case in which a sword seems admissible is in rifle corps; wherein, from the want of an efficient bayonet, some such defence against an enemy coming to close quarters is absolutely necessary.

FOOT, in *Mining*, signifies to reach the bottom of a stratum; thus to "foot a coal," is to sink a shaft through it to its under stratum or floor.

FOOT *of the eye's director*, in *Perspective*, is that point in the directing line made by a vertical plane passing through the eye and the centre of the picture.

FOOT *of the vertical line*, is that point in the intersecting line, made by a vertical plane passing through the eye and the centre of the picture.

FOOT, in the *Greek* and *Latin Poetry*, denotes a metre, or measure, composed of a certain number of long and short syllables.

The spondee, iambic, trochee, and pyrrhic, are dissyllabic feet; *i. e.* they consist of two syllables each; the dactyl, anapæst, molossus, tribrach, bacchius, antibacchius, amphibrachys, and creticus, are trisyllabic, or consist of three syllables each; the proceleusmaticus, choriambus, and epitrite, are quadrisyllabic, or composed of four syllables. See each under its proper head, SPONDEE, IAMBIC, &c.

There are also other feet, invented by grammarians, of five, six, or more syllables; but they are not worth the reciting.

Hexameter verses consist of six feet; pentameters, only of five.

A foot in poetry seems to resemble a bar in music. A *trine* among the ancients was a portion of that foot or bar; as with us a bar is divided into accented and unaccented parts. "Modern music, says Mr. Harris, Disc. on Mus. Paint. and Poet. p 73, 1st edit. has many different lengths of notes in common use, all which may be infinitely compounded, even in any one time or measure. Poetry, on the other hand, has but two lengths or quantities, a long syllable and a short, which is its half; and all the variety of verse arises from such feet and metres, as these two species of syllables, by being compounded, can be made to produce." What is here said of verse, is equally applicable to ancient music, which was strictly confined to verse: and it seems as if whole pages could not place the difference between the rhythm of ancient and modern music, in a clearer point of view. See TRINE, RHYTHM, ACCENT, and TACT. Beating time with the foot, see ARSIS and THESIS, and NOTATION *of Poetical Feet* in Greek and Latin verse. The different measures of poetry being called *feet*, the Greeks called ὑπορχημα a kind of poetry composed, not only to be sung to the sound of flutes and citharas, but to be danced at the same time. The Italian term ballata, the French ballade, and the English word ballad, had formerly the same import; implying severally a song, the melody of which was to regulate the time of a dance. And the different measures of poetry being called feet, both in ancient and modern languages, suggests an idea that dancing, if not anterior to poetry and music, had a very early and intimate connection with them both. The poet Simonides defined poetry an eloquent dance: and dancing, a silent poetry.

FOOT, *Even and odd*, par and impar. In poetry, and particularly in iambic verses, feet are denominated *odd* and *even*, in respect of their situation in the verse. Thus, the first, third, and fifth, foot of the verse, are uneven; because those numbers are not capable of being divided into two equal parts.

In the ancient tragedy, the iambic verses, which prevailed therein, only allowed uneven feet to the spondees; so that the second, the fourth, and sixth feet, were to be iambics, because they were even. This regular mixture of spondees in the uneven feet rendered the verse the mor solemn and noble.

The comic poets, the better to disguise their verse, and make it more like prose, took the contrary course; putting spondees where the tragic poets would only have allowed iambics.

FOOT is also a long measure, consisting of twelve inches. The foot long is divided into twelve inches, and the inch into barley-corns. Thus the English standard foot (31 Edw. I.) is = 12 lineal English inches, = 36 barley-corns, = 16 digits, = 4 palms, = 3 hands, = $5\frac{1}{3}$ nails, = $1\frac{1}{3}$ spans,

fpans, = 1.5151 Gunter's links, = .938306 pieds, or feet of France, = .3047 metres of France.

Geometricians divide the foot into ten digits, and the digit into ten lines, &c.

The French divide their foot, as we do, into twelve inches; and the inch into twelve lines. See *French* MEASURES.

The foot fquare is the fame meafure, both in length and breadth, containing 144 fquare, or fuperficial inches, = 2.295684 fquare links; and the glazier's foot in Scotland is = 64 fquare Scotch inches.

The cubic, or folid foot, is the fame meafure in all the three dimenfions, containing 1728 cubic inches Englifh = 6.128 ale gallons = 3.478309 cubic links = .0283 cubic metres or fteres of France. See *French* MEASURES.

The foot is of different lengths in different countries. The Paris royal foot exceeds the Englifh by nine lines and a half; the ancient Roman foot of the Capitol confifted of four palms, equal to eleven inches and feven tenths Englifh; the Rhinland, or Leyden foot, by which the northern nations go, is to the Roman foot as 950 to 1000. The portions of the principal feet of feveral nations, compared with the Englifh and French, are here fubjoined.

The Englifh foot being divided into one thoufand parts, or into twelve lines, the other feet will be as follow:

	Th. Pts.	F.	Inch.	Li.
London - - - Foot	1000	0	12	0
Paris foot, the royal, by Greaves	1063	1	0	9.7
Paris foot, by Dr. Bernard	1066	1	0	1
Paris foot, by Graham, from the meafure of half the toife of the Chatelet, the toife containing fix Paris feet -	$1065.41\frac{2}{3}$	0	0	0
By Monnier, from the fame data - - -	1065.351	0	0	0
From both thefe it may be fixed at - - -	1065.4	1	0	9.4
Amfterdam - - Foot	942	0	11	3
Antwerp - - —	946	0	11	2
Dort - - - —	1184	1	2	2
Rhinland, or Leyden —	1033	1	0	4
Lorrain - - —	958	0	11	4
Mechlin - - —	919	0	11	0
Middleburgh - - —	991	0	11	9
Strafburgh - - —	920	0	11	0
Bremen - - —	964	0	11	6
Cologn - - —	954	0	11	4
Franckfort on the Mayn —	948	0	11	4
Spanifh - - —	1001	0	11	0
Toledo - - —	899	0	10	7
Roman - - —	967	0	11	6
Bononia - - —	1204	1	2	4
Mantua - - —	1569	1	6	8
Venice - - —	1162	1	1	9
Dantzick - - —	944	0	11	3
Copenhagen - —	965	0	11	6
Prague - - —	1026	1	0	3
Riga - - —	1831	1	9	9
Turin - - - —	1062	1	0	7
The Greek - - —	1007	1	0	1
Old Roman - - - —	970	0	0	0
Roman foot, from the monument of Coffutius in Rome, by Greaves - - -	967	0	0	0
From the monument of Statilius, by the fame - -	972	0	0	0
Of Villalpandus, deduced from the congius of Vefpafian	986	0	0	0

Mr. Raper, who has induftrioufly collected a variety of authorities relating to the meafure of the old Roman foot, determines the mean to be nearly 968 thoufandth parts of the London foot. And by an examination of the ancient Roman buildings in Defgodetz's Edifices Antiques de Rome, Paris, 1682, he concludes, that the Roman foot before the reign of Titus exceeded 970 parts in 1000 of the London foot; and in the reigns of Severus and Dioclefian fell fhort of 965. Phil. Tranf. vol. li. art. 69. p. 774, &c.

The Paris foot being fuppofed to contain 1440 parts, the reft will be as follow:

Paris - - -	Foot	1440
Rhinland -	—	1391
Roman -	—	1320
London - -	—	1350
Swedifh - -	—	1320
Danifh - -	—	1403
Venetian - -	—	$1540\frac{2}{5}$
Conftantinopolitan	—	3120
Bononian - -	—	$1682\frac{2}{3}$
Strafburg - -	—	$1282\frac{5}{4}$
Norimburg -	—	$1346\frac{1}{4}$
Dantzick - -	—	$1721\frac{1}{2}$
Hall - -	—	1320

In Scotland, this meafure of length, though confifting of twelve inches, exceeds the Englifh foot, fo that 185 of the former is equal to 186 of the latter. Accordingly the Scotch foot = 12 Scotch inches, = $12\frac{1}{15}$ Englifh inches, according to fome, and $12\frac{12}{185}$ Englifh inches according to others. The glazier's foot in Scotland = 8 Scotch inches. For a further account of the foot, ancient and modern, and its proportions in different countries, fee MEASURE.

FOOT-*bank*, or *foot-ftep*, in *Fortification*. See BANQUETTE.

FOOT-*pace*, in *Architecture*, is a flat fpace in fome ftairs inftead of winders, always fituated between the ftarting place and the landing.

When the foot-pace occupies one quarter of a revolution at the turning it is called a quarter pace: and if it occupy half a revolution, it is called a half pace.

Foot-paces are introduced in order to fave the expence of winders, and to give reft to the afcendant in advancing up ftairs.

FOOT *of the foreft*, *pes forefta*, in our *Ancient Cuftoms*, contained 18 inches; or $1\frac{1}{2}$ of the common foot.

"Notandum eft, quod pes foreftæ ufitatus tempore Ric. Oyfell, in arrentatione vaftorum, factus eft, fignatus et fculptus in pariete cancellæ ecclefiæ de Edwynftone, et in ecclefia Beatæ Mariæ de Nottingham: Et dictus pes continet in longitudine octodecim pollices, &c." Ex Regift. Abb. de Novo. Loco in Com. Nott.

FOOT, *Fore*. See FORE-*foot*.

FOOT-*geld* was an ancient amercement, for cutting out the balls of the feet of great dogs in the foreft; to prevent their running after the king's deer.

FOOT-*guards*. See GUARDS.

FOOT-*hooks*, in a *Ship*. See FUTTOCKS.

FOOT, *Horary*. See *Univerfal* MEASURE.

FOOT-*bufks*, among *Gardeners*, are the fhort heads out of which flowers grow. See CALYX.

FOOT-*irons*, in *Engineery*, are pieces of iron plate, which the navigators or canal-diggers tye on to that part of the fole of their fhoes which ftrikes the top of their fpade or grafting-tool, in digging hard foil. See CANAL.

FOOT

FOOT *of a sail*, denotes the lower edge or bottom.

FOOT-*level*, an instrument which serves to do the office both of a level, a square, and a foot rule.

The foot-level, represented *Plate* IV. *Surveying*, *fig.* 1. consists of two branches, about an inch broad; opening and shutting like a two-foot rule.

These branches are hollowed half way up the side of each to receive a kind of tongue, or thin piece of brass, which is fastened to one of them, by means whereof the branches may be shut close together. The use of this tongue is such, that when the end of it is placed in the branch it is not fastened to, where there is a pin that holds it, the two branches will stand at right angles; to the head of the instrument is likewise added a square piece of brass; by means whereof it does the office of a square. At the bottom of the angle of the said piece of brass is a little hole, wherein is fastened a line with the plummet; which falling on a perpendicular line drawn on the tongue, shews whether any thing the instrument is applied to be level or not. See LEVEL.

FOOT, *lieutenant-colonel of*. See LIEUTENANT.

FOOT-*rule*. See RULE.

FOOT-*ropes*, are those to which the foot of the sail is sewed. They are also the same with the horses of the yards. See HORSE.

FOOT-*waleing* denotes the whole inside planks or lining of a ship, used to prevent any part of the ballast or cargo from falling between the floor-timbers.

FOOT-*halt*, in *Rural Economy*, is the name of an affection in the foot of the sheep, which does not yet seem to be well understood. It should be well cleaned from all sorts of dirt, and kept tied up with some discutient application. See SHEEP.

FOOT-*paths*, the walks, paths, or other tracks which are made in fields, by walking through them when the land is under the plough, or shut up for the purpose of hay or pasture; also the walks on the sides of public roads formed for foot passengers. In the former cases they are not unfrequently highly inconvenient and injurious to the farmer, from the mischief that is done in passing them by tearing up or beating down different sorts of crops.

FOOT-*plough*, in *Agriculture*, a name formerly much used to signify a kind of swing plough.

FOOT-*rot*, in *Rural Economy*, an affection or disorder in the feet of sheep. It mostly commences between the claws of the fore-feet, with a slight inflammation and swelling. In this way the sheep becomes lame, and some moisture oozes out between the claws, which has a highly disgusting smell; and in proportion as the disease becomes more inveterate, it gets under the hoof, producing proud flesh. It has been commonly supposed to be infectious, on account of its spreading with such rapidity when not promptly removed. Most of the long woolled and Merino breeds of sheep, are said to be very subject to this disease; but other sorts of sheep are likewise found to frequently suffer from it.

In its removal, the part affected should be pared and well cleaned without touching the quick, and then a caustic solution of the following kind dropped upon it, the foot being kept well wrapped up from the dirt. Two ounces of blue vitriol, the same quantity of roach alum, and one ounce of verdigris, with a quarter of an ounce of muriated quicksilver, should be dissolved in a quart of good distilled vinegar. But there are many who make use of butter of antimony, applying it to the part by means of an iron skewer, after being pared in the manner stated above. It is said to be a very effectual remedy in this affection

It is always a proper precaution to separate the sheep that are thus affected from the rest of the flock. And it has been stated that the change of the sheep into a more short dry pasture, is of great use in obviating the complaint. See SHEEP.

FOOT-*trenches*, in *Agriculture*, a term sometimes employed to signify small superficial drains not more than a foot in width.

FOOTA, in *Geography*, a country of Africa, near the source of the Gambia. N. lat. 10° to 11°. W. long. 10° to 11°.

FOOTA TORRA, a country of Africa, between the rivers Senegal and Gambia, N. of Woolly, and N.W. of Bondou.

FOOTE, SAMUEL, in *Biography*, a celebrated English comedian and dramatic writer, was born in the year 1717 at Truro, in Cornwall, where his father was in the commission of the peace. He received his education at Worcester college, Oxford, whence he removed to the Temple. But disliking the dry study of the law, he turned his attention to the stage, and made his first debut in the character of Othello, in the Moor of Venice. He opened on his own account, in 1747, the little theatre in the Haymarket, with a piece written by himself, entitled "The Diversions of the Morning." The next season he succeeded beyond his expectations, by the favourable reception of another of his own compositions, "An Auction of Pictures;" in which he holds up to the mirror of ridicule many of the most distinguished characters of the time. During this period, he continued to perform some of the principal comic characters at Covent Garden and Drury Lane theatres. Having, in a hunting party with the duke of York, the misfortune to fall from his horse, by which he fractured his leg, and was constrained to suffer amputation; the duke so far sympathized with his loss, as to procure him a patent for life to act comedies at the Haymarket, annually from the 15th of May to the 15th of September; on which occasion, in 1766, he considerably enlarged the theatre. In a piece which he brought out in 1776, he made a most pointed attack on the duchess of Kingston's character, which made him many enemies, who cruelly retaliated upon him by charging him with an unnatural crime; and though he was honourably acquitted of the offence, yet the stigma on his fame made such a deep impression on his mind as to impair his health; and he was seized with a paralytic affection, which terminated fatally. Previous to that event, he had determined on quitting England, and spending the remainder of his days in France; but died suddenly at Dover, on his way thither, October 22, 1777. He appears to have had a presentiment of his death, in which he was not disappointed. Prior to his departure for the continent, he viewed attentively the portrait of his friend Weston, a celebrated actor, which he kept in his cabinet, and with tears in his eyes was heard to exclaim "Poor Weston!" and to add in the same tone of dejection; "in a short time others shall say, poor Foote!" His remains were buried in Westminster abbey. In him the nation lost an actor of fine imagination, and a favourite of nature. As a writer, he possessed a fund of wit, and a vast aptitude to seize and improve the ridiculous; but took unwarrantable liberties in exposing the natural failings or peculiarities of manners in living characters. So little did he attend to method in composition, that it is said he could never form a regular plan, or wind up properly a plot. His pieces are principally farces, or farci-comedies, which from their wit and point have procured for him the title of the *English Aristophanes*. Of these, twenty with his name are published under the title of "The Comic Theatre," three vols. 12mo. out of which it has

been

been obferved that the " Young Hypocrite" is the only one wholly of his own compofition. See Biographica Dramatica, and Cooke's Memoirs of Samuel Foote.

FOP, probably derived from the *vappa* of Horace, applied in the firft fatire of his firft book to the wild and extravagant Nævius, is ufed among us to denote a perfon who cultivates a regard to adventitious ornament and beauty to excefs.

FOPPENS, John Francis, in *Biography*, a learned Flemifh divine, was born about the year 1689. Of his early life no particulars have been recorded. He was one of the profeffors of theology at Louvain, obtained preferment in the church, and high refpect from his contemporaries on account of his erudition and virtues. He was author of " Bibliotheca Belgica," in two vols. 4to. 1739. He publifhed a new edition of Miræus's " Opera Hiftorica et Diplomatica," with notes and tables in two volumes folio. He was likewife author of " Hiftoria Epifcopatus Antwerpienfis :" " Hiftoria Epifcopatus Sylvæducencis ;" and " Chronologia Sacra Epifcoporum Belgii ab anno 1561, ad annum 1761," 12mo. a work in verfe with hiftorical notes. He died in 1761, in the feventy-fecond year of his age.

FORA, in *Geography*, a river of Naples, which runs in o the Adriatic. N. lat. 42° 26'. E. long. 14°.

FORABOSCO, Girolamo, in *Biography*, a painter, who practifed the art both in hiftory and portraiture, but principally the latter, and that with confiderable fuccefs. He was born at Venice about the year 1600, but the precife time is not known. The principal fcene of his exertions was Venice, where many of his performances are ftill preferved ; particularly portraits of the Doge Contarini, painted in 1655, and of the Doge Pefaro in 1659. His moft juft characteriftics are natural and brilliant colouring, and freedom of execution. The period of his death is alike unknown with that of his birth.

FORADADA, in *Geography*, a fmall ifland in the Mediterranean, near the ifland of Majorca, where the fon of the king of Arragon formerly erected a college for the purpofe of inftructing fome Francifcan monks in the Arabic language, for converting the Moors.

FORAGE. See Forrage.

FORAMEN, in *Anatomy*, a hole. The term is employed moftly in the fkeleton, and is applied to the openings which penetrate a bone. It is ufed, therefore, moft commonly in the head, as the apertures are moft numerous there. A complete lift of the foramina of the head is fubjoined to the article Cranium.

Foramen *Commune anterius and pofterius*, are two openings in the brain. See Brain.

Foramen *Epiploicum*, an opening that leads into the cavity of the great omentum. See Epiploon.

Foramen *of Monro*, a name given to a flit-like paffage leading from the lateral ventricle through the foramen commune anterius to the third ventricle of the brain ; which Dr. Monro did not difcover. See Brain.

Foramen *Ovale*, of the heart ; a paffage of communication in the fœtus, between the two auricles. See Heart.

Foramen, in *Natural Hiftory*, is a term applied to the apertures obfervable in fome fpecies of *echini*, diftinct from the mouth and vent : in the compreffed or flat echini they are often large pervious holes, formed by the local coalefcence of the oppofite fides of the fhell, and are from two to fix in number.

FORAMINULENTUS, Tractus Spiralis, in *Anatomy*, a part of the external furface of the cochlea, perforated by very numerous fmall openings for tranfmitting the filaments of the auditory nerve. See Ear.

FORBACH, in *Geography*, a town of France, in the department of the Mofelle, and chief place of a canton in the diftrict of Sarreguemines ; 7 miles N.W. of it. The place contains 1,715, and the canton 9,472 inhabitants, on a territory of $212\frac{1}{2}$ kiliometres, in 25 communes.

FORBES, Patrick, in *Biography*, was born in the year 1564. He was one of the Scotch nobility, under the title of lord of Corfe, and baron of O'Neil in the county of Aberdeen. He was educated partly at Aberdeen, and partly at St. Andrew's. When he was able to take an active part in the bufinefs of life, the affairs of the church of Scotland were in a ftate of great confufion, and he foon made himfelf confpicuous by the encouragement which he held out to able and pious minifters, and by the inftructions which, notwithftanding his being a layman, he perfonally delivered to the people. He was alfo well known by the conferences which he held for the converfion of the papifts, who would hear nothing from the pulpit. Such fervices, in behalf of the proteftant caufe, were not unnoticed or forgotten in times of difficulty, and he was repeatedly urged, by perfons of high rank in the church and ftate, to engage in the work of the miniftry. After much hefitation on his part, he was, in the forty-eighth year of his age, ordained prefbyter, and admitted minifter of Keith, where he difcharged the paftoral functions with great acceptability and applaufe. In 1618, he was nominated by the king to the fee of Aberdeen, which he accepted, though it is faid, with much real and unaffected reluctance. His zeal was equal to the difcharge of the moft important and extenfive duty, but he did not well underftand the principles of toleration, which are alfo the principles of pure Chriftianity. He joined his brethren in infringing on the rights of thofe who were attached to particular ceremonies, by enjoining certain obfervances relative to the reception of the eucharift, and other matters to which they could not confcientioufly conform. He was not, however, a perfecutor, and fcorned to make ufe of vigorous meafures to carry his point. Some time after his promotion to the bifhopric he was elected chancellor of the univerfity of Aberdeen, and under his fuperintendance and patronage that feat of learning rofe to confiderable diftinction ; he repaired and ornamented the buildings, increafed the library of the univerfity, revived the feveral profefforfhips of divinity, canon law, and phyfic, and procured, by his influence, a new profefforfhip of divinity. The good bifhop lived long enough to be amply repaid for all his attention and liberality, by the number of able and worthy men who were educated there. He died in 1635, being in his feventy-firft year, leaving behind him a " Commentary on the Revelations," which was printed in 1613 : and a work entitled " Exercitationes de verbo Dei, et Differtationes de verfionibus vernaculis." In his conduct as a bifhop, he appears to have been uniformly influenced by an honeft regard to the obligations of the character which he had affumed, and what he conceived to be the beft means of promoting the interefts of piety and virtue. If, at any time, he erred in the means of doing good, it was an error of judgment, and he is faid by bifhop Burnet to have " greatly allayed, and almoft conquered, not only the diftempered judgments, but the perverfe and turbulent humours of divers perfons in his diocefe." He was careful in the choice of clergymen, and was anxious to make provifion for their fupport, and that of their fucceffors. He was vigilant and ftrict in examining candidates for orders, and frequently vifited his diocefe to enquire into the conduct of thofe who exercifed the important office of minifters of religion.

religion. In his viſitations he proceeded without pomp, attended by a ſingle ſervant, that he might be more readily informed of what belonged to his care. He would frequently attend the ſermons of his clergy, in ſuch a way as to excite no ſuſpicion that he was more than a common hearer, to aſcertain their uſual ſtrain of preaching, and after ſervice he would encourage or admoniſh the miniſter, as he ſhould judge proper. Biog. Brit.

FORBES, JOHN, ſon of the preceding, was born at Aberdeen about the year 1593, where he was chiefly educated, but he made choice of Heidelberg as the place to finiſh his ſtudies under the celebrated David Pareus. Before he returned to his native country, he viſited other German univerſities, and made himſelf maſter of the Hebrew language, and of all the departments of knowledge uſually connected with theological purſuits. His great learning excited the attention of Burnet, who ſays, that perhaps he was excelled by none of that age. At Aberdeen he was appointed to the new profeſſorſhip of divinity which his father had been the means of eſtabliſhing, and diſcharged the duties connected with the office with great reputation, till he was deprived of it by the preſbyterian party in the reign of Charles I. Being determined not to abandon the epiſcopal principles, he ſought refuge in Holland, where he wrote his "Hiſtorico-Theological Inſtitutions," which conſtituted a moſt learned and valuable work of the kind. On his return to Scotland he retired to his eſtate of Corſe, where he ſpent his time in making additions and improvements to his "Inſtitutions," which, however, he did not live to publiſh. He died in his fifty-fifth year. Beſides the work already referred to, he was author of "Irenicum Amatoribus Veritatis et Pacis in Eccleſia Scoticana," "Annotations" to a Latin tranſlation of his father's Commentary upon the Apocalypſe, "Ten books of Moral Theology," which were all collected and publiſhed in two vols. folio at Amſterdam in 1703.

FORBES, WILLIAM, the firſt biſhop of Edinburgh, was born in the year 1585. He was educated at Aberdeen, the place which gave him birth; and ſo diſtinguiſhed were his abilities, that he was very ſoon appointed profeſſor of logic in the new inſtitution of Mariſchal college, and diſcharged the duties of the place with much ſucceſs and high reputation. After this he ſpent four years in the ſtudy of divinity, eccleſiaſtical hiſtory, and Hebrew, at different German univerſities. From thence he went to Leyden, where he obtained the eſteem and friendſhip of Scaliger, Grotius, Voſſius, and the other learned men of that univerſity. From Holland he paſſed to England, and was appointed Hebrew profeſſor of Oxford. His health ſoon required him to return to his native country, where he became celebrated as a preacher; and when king James, in concurrence with the deputies of the clergy, had determined that the manner of conferring academical honours ſhould be reſtored to the ancient courſe, Mr. Forbes was admitted to the degree of doctor of divinity. The exertions of public ſpeaking being more than his conſtitution could bear, he reſigned the miniſterial duties, and was nominated to the poſt of principal of Mariſchal college; and almoſt immediately afterwards he was created dean of the faculty of theology, and made rector of the univerſity. He next accepted, though not without reluctance, of an invitation to Edinburgh; but the ſentiments of the people were ſo diſcordant from thoſe which he held on ſubjects of church government and diſcipline, that his popularity and uſefulneſs ſoon declined. He accordingly reſigned his charge, and returned to Aberdeen, where the ſentiments of the clergy and people were more congenial with his own. In 1633, when Charles I. was crowned at Edinburgh, Dr. Forbes was appointed to preach before him: the monarch was ſo highly pleaſed with his ſervices, that he created a new ſee, *viz.* that of Edinburgh, in order to make Forbes a prelate. This honour, which was ill reliſhed by the people, he did not long enjoy, being cut off by a fever in 1634, in the fiftieth year of his age, and within three months of his conſecration. He ſpent his life in endeavouring to effect peace and union among Chriſtians; and, after his death, a treatiſe of his was publiſhed, entitled, "Conſiderationes modeſtæ et pacificatæ Controverſiarum de Juſtificatione, &c." According to biſhop Burnet, he was "a great and ſublime divine, who preached with ſo much zeal and ardour, that, frequently forgetting the meaſure of time, he continued his ſermons for two or three hours." Biog. Brit.

FORBES, DUNCAN, a celebrated lawyer, and diſtinguiſhed judge, commonly called lord Forbes, was the younger ſon of a reſpectable family at Culloden, in the ſhire of Inverneſs, born in the year 1685. His natural inclination led him to the army; but his friends diſcovering a ſuperiority of genius, adviſed him to devote his attention to the ſtudy of literature, in which he made a conſiderable progreſs. The narrow circumſtances of a ſecond brother induced him to conſult with himſelf on the moſt probable means of raiſing a fortune, and ſupporting the credit and reputation of his family. Prudence quickly pointed to the profeſſion of law; and having been admitted to the Scottiſh bar, he ſoon obtained great and merited encouragement; but where he never proſtituted that nervous and perſuaſive eloquence, for which he was notable, to ſupport an illegal or litigious cauſe. For even in the early part of life, when ſtraitened as to pecuniary circumſtances, he had laid down as one rule for the direction of his conduct, a generous contempt of money: a maxim he conceived eſſential to the formation of what he conſtantly aſpired to, an unblemiſhed character. By noble means like theſe he ſoon became eminently diſtinguiſhed, and roſe to the higheſt honours of his profeſſion. In 1717, he was appointed the king's ſolicitor-general for Scotland, and ſoon after unanimouſly elected to repreſent that country in the Britiſh ſenate; a truſt he diſcharged with ſo much honour and fidelity, as to obtain the thanks of his conſtituents, and the favour of his ſovereign; who nominated him, in the year 1725, to the dignified office of lord-advocate. As he advanced in years, his uſefulneſs increaſed; and his great capacity and unſullied reputation were the ſole reaſons aſſigned for his exaltation to the preſident's chair, which he filled with ſuch legal diſcernment and unbiaſſed judgment as will add a conſiderable portion of weight to its future deciſions. He not only ſhone in the character of a judge, but his patriotiſm and loyalty were equally conſpicuous. His zeal for the ſafety, welfare, and tranquillity of his country were on all occaſions apparent; but in no inſtances more than during the trying periods of the rebellion in behalf of the pretender, in the years 1715 and 1745: and for his reaſons, ſee his letter to the lord Lovat, who afterwards, for treaſonable conduct, ſuffered decapitation. Even in the vacations, he was conſtantly engaged with unwearied diligence in promoting the intereſts of agriculture, trade, and manufactures; and with unabated aſſiduity defending and promulgating the great truths of religion. After a life devoted to the cauſe of honour and virtue, and extended ſufficiently long for himſelf, though not for his country, he died in 1747, lamented by thoſe who had the pleaſure of his acquaintance, and regretted by all the friends of liberty and of truth. His lordſhip was well verſed in the original languages of the Scripture, particularly

ticularly the Hebrew, ; as is evident from "a Letter to a Bifhop on the Writings and Difcoveries of Hutchinfon," and which contains the cleareft fyftematic view of that author's peculiar tenets ever yet publifhed. He wrote alfo "Thoughts concerning natural and revealed Religion," and "Reflections on Infidelity;" the whole of which have been collectively printed in one volume, 12mo. 1750. His Thoughts on Religion and Letter to a Bifhop were tranflated into French, by the celebrated writer Pierre Houbigant; and though containing fentiments fo repugnant to the national belief of France, yet they obtained a very extenfive circulation in that country. Life of Duncan Fourbes, 8vo. London Magazine for the year 1747. And Nouveau Dictionnaire Hiftorique.

FORBES, in *Geography*, a town of Bohemia, in the circle of Bechin; 8 miles S.E. of Budweifs.

FORBES'S *Iflands*, three iflands in the South Pacific ocean, about 5 leagues from Bolt Head, a cape on the N.E. coaft of New Holland. S. lat. 12° 25'.

FORBIN, CLAUDE, in *Biography*, a diftinguifhed French naval commander, was born in 1656, and entered the fea-fervice when he was very young. In 1686, he accompanied the French ambaffador De Chaumont to Siam, and was left there as admiral of the country. Upon his return, he diftinguifhed himfelf in various actions in the Adriatic, the Channel, and the North fea, and took prizes of great value. He became formidable to the Englifh; attacked their fleet bound for Lifbon, took and deftroyed part of the convoy, and captured feveral of the merchant fhips. About the year 1708, he was the active friend of the pretender, and undertook to convey him fafe to Scotland; but admiral Byng obliged him to retire. In 1710, a penfion being fettled on him, he took up his refidence near Marfeilles, where he died in 1733. Forbin was highly regarded by his country for courage and diligence in the difcharge of his duty. He was generous and difinterefted. Going to court to return thanks for a reward which the king had beftowed upon him, he took occafion to difplay the fervices of John Barth, the famous Dunkirk captain, whom he thought neglected. The liberality of his mind ftruck the monarch fo forcibly, that he exclaimed to his minifter, that he rarely met with examples of this kind at his court. Forbin was author of "Memoirs," in 2 vols. 12mo. Moreri.

FORCADO, or RIO DE FORCADOS, in *Geography*, a river of Africa, which rifes far inland to the N.N.E., with many windings, in moft places two miles wide, but of depth that allows only veffels which draw feven or eight feet water. It runs into the Atlantic, 45 miles S.S.E. from the river Formofa, N. lat. 6°.

FORCALQUIER, FORUM CALCARIUM, a town of France, and principal place of a diftrict, in the department of the Lower Alps, fituated in a delightful tract, watered by the Laye; formerly the capital of a country independent on Provence, and united to it in 1193; 7 leagues S.S.W. of Sifteron. The place, which is noted for three annual fairs, contains 2,539, and the canton 9,418 inhabitants, on a territory of 247½ kiliometres, in 14 communes. N. lat. 43° 57'. E. long. 5° 51'.

FORCAS, a town of Walachia; 3 miles N. of Caracalla.

FORCE, LA, a town of France, in the department of the Dordogne, on the Dordogne; the chief trade of which confifts in cattle, grain, and wine; 6 miles W. of Bergerac.

FORCE, in *Mechanics*. The nature of force being entirely unknown, it can only be defined by its effects. Whatever produces or tends to produce motion, or a change of motion in any body, is called a force. We are accuftomed to confider velocity as a meafure of force, upon the fuppofition that under exactly fimilar circumftances the velocity is proportional to the force; an hypothefis moft highly probable, but not eafily demonftrable. Velocity is in itfelf a compound idea, arifing from a certain relation between time employed and fpace defcribed. If a body A, fuppofed a material point, move uniformly, and without changing its direction from one point a to another b, the line $a\,b$ is the fpace defcribed by the body A. If another body B move uniformly in the fame manner from c to d, the line $c\,d$ is the fpace defcribed by the body B. Now thefe fpaces can eafily be compared, either by their being reprefented or related to us in fome ftandard meafure with which we are acquainted. In the fame manner, the time in which each line is defcribed may be defined by fome known ftandard meafure, as a fecond, a minute, &c.: the times and fpaces may then be refpectively expreffed in abftract numbers. And from confidering the relation of thefe numbers to each other, has arifen our idea of velocity, which in uniform motion is the relation between the fpace and time employed to defcribe it; and confidering velocity as an abftracted number, it is faid to be equal to the fpace divided by the time. And thus different velocities may be compared.

Judging of force by its effect, we are naturally led to confider velocity, or the fpace defcribed in a given time as its meafure. But ignorant as we are of its nature, there is no mathematical contradiction in fuppofing that force may be expreffed by other functions of the velocity, as for example, that it may be proportional to the fquare or cube of the velocity. La Place has fhewn, by a very ingenious inveftigation, how we may experimentally be convinced of the proportionality of force to velocity, or at leaft that fince the difference *muft be*, if any, extremely fmall, it is highly improbable that any fhould exift. It can be fhewn, that if any confiderable variation exifted in this law, the relative motions of bodies on the earth's furface would be fenfibly affected by the motion of the earth, that is, that the effect of a given force would vary very much according as its direction coincided with or was oppofed to the direction of the earth's motion. The effects of the fame apparent forces would vary likewife in different feafons of the year, as the velocity of the earth is about one thirtieth greater in winter than in fummer. Now fince no variation of this kind is difcernible, we may fafely infer the proportionality of force to velocity. To comprehend the reafoning on which the above conclufion is obtained, we may fuppofe two bodies moving upon one ftraight line with equal velocities; and that by impreffing on one of them a force which increafes the primitive force, its relative velocity to the other body remains the fame as if both of them had primitively been in a ftate of repofe. It is evident that the fpace defcribed by the body in confequence of its primitive force, and of that which is added to it, becomes equal to the fum of the fpaces which each of them would have caufed it to defcribe in the fame time, which fuppofes the force proportional to the velocity.

This law, and the law of *inertia*, which expreffes the tendency of a body to perfevere in a ftate either of reft or motion, may be confidered as derived from obfervation and experiment. They are the moft fimple and natural that can be imagined, and are fufficient to ferve as a bafis for the whole fcience of mechanics.

The direction of a force is the ftraight line which it tends to make a body defcribe.

Conceiving two forces to act on a material point, it is evident

evident, that if the two forces act in the fame direction, they will increafe the effect of each other; but if they act in oppofite directions, the point will only move in confequence of their difference, and it would remain at reft if the forces were equal. If the directions of the two forces make an angle with each other, the refulting force will take a mean direction, and it can be demonftrated geometrically; that if, reckoning from the point of interfection of the two directions of the forces, we take on thefe directions ftraight lines to reprefent them, and then form a parallelogram with thefe ftraight lines, its diagonal will reprefent, both as to its direction and magnitude, their refulting force. The refulting force thus determined (and which reprefents likewife the velocity of the moving point) may therefore be fubftituted as an equivalent force to the two compofing forces; and reciprocally for any force whatever, we may fubftitute any two forces which, according to the above rule, would compofe that force. Any force therefore may be decompofed into two others parallel to two axes fituated in the fame plane, and perpendicular to each other. To do this, it is fufficient to draw from the firft extremity of the line reprefenting the force two lines parallel to thefe axes, and to form with thefe lines a rectangle, the diagonal of which will be the force required to be decompofed. The two fides of this rectangle or parallelogram will reprefent the forces into which the given force may be decompofed parallel to thefe axes. If the force is inclined to a plane given in pofition, then taking to reprefent it a line in its direction, the extremity of which is on the furface of the plane, the perpendicular which falls from the other extremity will be the primitive force decompofed in the direction perpendicular to the plane. The ftraight line which in the plane joins the other extremity of the line reprefenting the force with the perpendicular (or the orthographic projection of the line on the plane) will reprefent the primitive force decompofed parallel to the plane. This fecond partial force may be itfelf decompofed into two others, parallel to two axes in the fame plane perpendicular to each other. Thus, every force may be decompofed into three others parallel to three axes perpendicular to each other, which axes are in the language of modern geometry called *rectangular co-ordinates*.

Hence arifes a very fimple method of having the refulting force of any number of forces, which are fuppofed to act upon a material point; for by decompofing every one of them into three others parallel to three axes given in pofition, and perpendicular to each other, it is clear that all the forces parallel to the fame axis will be reduced to one fingle force, equal to the fum of the forces which act in one direction, minus the fum of thofe which act in a contrary direction: thus the point will be folicited by three forces perpendicular one to the other. If now three ftraight lines in each of their directions be taken to reprefent them, reckoning from the point of interfection (called the *origin of the co-ordinates*,) and on thefe ftraight lines we form a rectangular parallelopipedon, the diagonal of this folid will reprefent both the quantity and direction of the refulting force of all the forces which act upon the point.

This fimple method has been uniformly followed by La Grange in the "Mechanique Analytique," and by La Place in the "Mechanique Celefte." It was firft adopted by Maclaurin.

The principle of the compofition of forces is of the moft extenfive utility in mechanics; it is fufficient alone to determine the law of equilibrium in every cafe. For by compofing fucceffively all the forces two by two, and taking the refulting force as a new force, we arrive at a force which muft be equivalent to all the reft, and which, in cafe of equilibrium, muft equal *zero*, when the fyftem under confideration has no fixed point; but if there be an immoveable point by the conditions of the problem, then the refulting force arifing from all the producing forces muft neceffarily pafs through that point.

It is admitted by all writers on this fubject, that the moft abftrufe propofitions relating to the doctrine of forces may be deduced from a few fimple principles; yet in the choice of thefe, few authors are found entirely to agree. The moft natural and advantageous method feems to be that in which the relation which fubfifts between different forces in a ftate of equilibrium is firft inveftigated, and then the confideration extended to a body in motion. In the cafe of a body folicited by feveral forces, but remaining in equilibrium, each force is fuppofed to produce only a tendency to motion, which tendency is meafured by the motion it would produce, if it were not impeded by the action of the others; and expreffing the effect of any one force by unity, the effect of the others relatively to this may be expreffed by numbers or by lines.

La Place affumes only the two principles mentioned above, which he regards as experimental facts. Dr. Young, in his Lectures, is inclined to confider them as capable of demonftration; but this flight difference of opinion is but of fmall importance to the fcience, fince all admit the fame principles, and agree that they are eftablifhed in the moft fatisfactory manner.

La Grange founds the whole doctrine of the equilibrium of forces on the well-known principle of the lever, on the compofition of motion, and on the principle of virtual velocity. The principle of the lever may be derived from the compofition of forces, and even from much lefs complicated confiderations.

Archimedes is the earlieft author upon record who attempted to demonftrate the property of the lever; he affumes the equilibrium of equal weights at equal diftances from the fulcrum as an axiom in mechanics, and reduces to this fimple and primitive cafe that of unequal weights, by fuppofing thefe, when they are commenfurable, divided into equal parts, feparated and placed on different points of the lever at equal diftances, fo that the whole lever may be loaded with a number of fmall equal weights at equal diftances from the fulcrum.

The principle of the ftraight and horizontal lever being admitted, the law of equilibrium in other machines may be deduced from it: there is, however, fome difficulty in referring the inclined plane to this principle; and the laws relating to it were, for a long time, unknown to mathematicians.

Stevinus, mathematician to prince Maurice of Naffau, was the firft that gave a demonftration of it, by a very indirect, but at the fame time a very curious method of reafoning.

He confiders the cafe of a folid triangle refting upon its horizontal bafe; its fides then become two inclined planes: he then imagines a flexible chain confifting of a number of fmall equal weights threaded together, and fo thrown over the triangle, that the upper part may reft on the two inclined planes, and the lower part hang fufpended freely underneath, in the fame manner as if attached to the lower extremities of the bafe. He then remarks, that if the chain is not in equilibrio, it will begin to flide along the plane, and the fame caufe fubfifting, it fhould continue to flide for ever, producing a perpetual motion; but this implying a contradiction, we muft conclude it to be in equilibrio, and if fo, fince the efforts of all the weights applied to one fide exactly counterbalance all thofe

thofe applied to the other, and the number of weights are in the fame ratio as the lengths of the planes; he concludes, that the weights will be in equilibrio on the inclined planes when they are to each other as the lengths of the planes: but when the plane is vertical, the power is equal to the weight; therefore, in every inclined plane, the power is to the weight as the height of the plane to its length.

The virtual velocity is that which a body in equilibrium is difpofed to receive, in cafe the equilibrium is difturbed; or that which the body will really receive in the firft inftant of its motion; and the principle of virtual velocities, fo much ufed by writers on the continent, in its moft general form, is this. If a fyftem, compofed of any number of bodies or points which are drawn in any direction by any forces whatever, be in equilibrium, and a fmall motion be given to the fyftem by virtue of which every point defcribes an infinitely fmall fpace, which will exprefs its virtual velocity, then the fum of the forces, multiplied each by the fpace defcribed by the point to which it is applied, in the direction of the force, will be equal to zero; eftimating as pofitive the fmall fpaces defcribed in the direction of the forces, and negative thofe defcribed in a contrary direction.

Galileo feems to have been the firft writer on mechanics who was acquainted with this principle, in his treatife, "Della Scienza Mecanica," and in his dialogues he propofes it as a general property in the equilibrium of machines.

Des Cartes likewife deduced the equilibrium of different forces from a principle fimilar to the above, but prefented under another point of view, and fomewhat lefs general. According to him, neither a greater nor lefs force is required to lift a weight to a certain height, than to lift an heavier weight to a height proportionally lefs, or a fmaller weight to a height proportionally greater. So that two weights will be in equilibrio, when the perpendicular fpaces defcribed by them are reciprocally proportional to the weights; but in the application of this principle we muft only confider the fpaces defcribed in the firft inftant of motion, or we fhall not attain the accurate law of equilibrium.

Torricelli, the celebrated difciple of Galileo, is the author of another principle, which is nearly to the fame effect, or is rather a neceffary confequence of the principle of Galileo. It is, that when two weights are fo connected, that, being placed in any manner, their centre of gravity neither rifes nor falls; then in all thefe fituations they will be in equilibrio. Torricelli applies this principle to the inclined plane, but it can be demonftrated to hold good in all machines generally. From this arifes another principle, which fome authors have recurred to, to folve various problems relating to the equilibrium of forces. When a fyftem of ponderable bodies is in equilibrio, the centre of gravity is the loweft poffible. For it can be fhewn by the theory "De Maximis & Minimis," that the centre of gravity of a body is the loweft, when the differential of its defcent is zero; that is, when the centre of gravity neither afcends nor defcends by an infinitely fmall change in the pofition of the fyftem.

John Bernouilli is the firft author who perceived the great utility of generalizing this principle of virtual velocity, and applying it to the folution of problems, as may be feen in one of his letters to Varignon, dated 1717, and which this latter has inferted in the ninth fection of his "Nouvelle Mechanique," which is entirely employed in fhewing the truth of this principle, and its great utility when applied to the folution of different cafes in ftatics.

From the fame fource originated another principle, propofed by Maupertuis in the Memoirs of the Academy for 1740, under the name of the "Law of Repofe," and which was afterwards extended by Euler, and explained in the Memoirs of the Academy of Berlin for 1751. Of the fame nature is the principle affumed by M. Courtivron in the Memoirs of the Academy for 1748 and 1749; and which confifts in this, that of all the fituations which a fyftem of bodies can fucceffively take, that in which the *vis viva* is a maximum or minimum is likewife that in which the fyftem muft be placed, to remain in equilibrio; the *vis viva* of a fyftem being defined the fum of the refpective maffes of which the fyftem is compofed, multiplied each into the fquare of its velocity.

But of all thefe methods, that of virtual velocity (from which indeed all the others are derived) feems to be the moft generally ufeful. Practical examples of the analytic proceffes, by which general formulæ or equations for the equilibrium of any fyftem of forces may be determined, are given by La Grange; and La Place demonftrates the principle on which the calculus is founded.

It fhould be obferved that force is here fuppofed to be the product of the mafs of a material point, by the velocity it would receive if entirely free. If we confine thefe confiderations to the cafe of a fingle material point, the conditions of equilibrium will be found analogous to thofe above-mentioned, but much fimplified.

The moft elementary equation to exprefs the ftate of equilibrium of a material point acted on by any number of forces is, that every force multiplied by the element of its direction is equal zero; that is, if we fuppofe the point to change its pofition an infinitely fmall quantity in any direction, then in the cafe of equilibrium, if every force be multiplied by the elementary fpace which the point has approached to, or receded from, the force eftimated in its direction, the product will be zero.

This fuppofes the point or particle free; but if it is conftrained to move on a curve furface, it will then experience a re-action from this furface equal and contrary to the preffure which the particle exerts on the furface, and which will be perpendicular to it, or in the direction of the radius of the curve. This re-action, therefore, may be confidered as a new force, and the re-action multiplied by the elements of its direction muft be added to the former equation; but if the variation of pofition, inftead of being taken arbitrarily, be taken upon the curve, fo as not to alter the conditions of the problem, fince the elementary variation of the radius is evidently equal to zero, the preceding equation ftill holds good.

Moreover, if the magnitude or intenfity of any force, multiplied by the diftance of its direction from any fixed point, be called its *moment* relative to that point, then it is found that the fum of the moments of the producing forces is always equal to the moment of the refulting force; and in the cafe of equilibrium, the fum of the moments of all the forces is equal to zero.

When the forces which act on a point, or a body, or a fyftem of bodies, are not fo proportioned as to maintain the fyftem in equilibrium, motion neceffarily takes place, and the laws of this motion may be deduced by extending the principles which were employed in the inveftigation of the ftate of equilibrium: this is the method employed by La Grange, and fubfequently by La Place. La Grange, with the principle of virtual velocities, combines the principle of d'Alembert, which is extremely fimple; indeed it may be

considered as an axiom, but which, though very obvious, remained long unobserved.

It is this: if several bodies have a tendency to motion, with velocities and in directions which they are constrained to change, in consequence of their reciprocal action on each other, then these motions may be considered as composed of two others, one which the bodies actually take, and the other such, that had the bodies been acted on by these alone, they would have remained in equilibrium.

To illustrate this theorem by an example; suppose two unelastic bodies or balls, whose masses are M and m, meet in the same direction with velocities V, v, respectively, required the common velocity after the shock.

Decompose the velocity V into x and $V - x$,
and the velocity v into x and $v - x$.

The velocities $V - x$ and $v - x$ will be destroyed, but as they alone would have maintained the bodies in equilibrio, they must be inversely as their masses; hence but one in this case must be taken with the contrary sine: hence

$$V - x : - v + x :: m : M$$
$$M V - M x = - m v + m x$$
$$M V + m v = M x + m x$$
$$x = \frac{M V + m v.}{M + m}$$

If a body or material point M (*Plate* XXVIII. *Mechanics, fig.* 6.) be supposed to move from A to B in the line AB by the action of some accelerating force P, its velocity, during any small elementary space pq, may be considered as uniform, and expressed by $\frac{dx}{dt}$, x being the space at the time at the commencement of a new instant dt, (in which is described the space qr). The increase of force or velocity which M receives may be expressed by $P . dt$; P representing the intensity of the force. The velocity, therefore, at the *commencement* of this new instant, will be $\frac{dx}{dt} + P . dt$; but this initial velocity may, by d'Alembert's theorem, be decomposed into two others, of which one will remain and the other be destroyed; and the velocity destroyed will be such, that if M had been solicited by that alone, it would have remained in equilibrium. Now the velocity remaining is evidently $\frac{dx}{dt} + d . \frac{dx}{dt}$, and the velocity destroyed therefore $P . dt - d . \frac{dx}{dt}$; since these two quantities together equal $P . dt + \frac{dx}{dt}$.

If the point M therefore had been solicited only by the force $P . dt - d . \frac{dx}{dt}$, it would have remained in equilibrium; hence

$$P . dt - d . \frac{dx}{dt} = o$$

$$\text{and } P = \frac{d^2 x}{dt^2}.$$

which is the general differential expression for the accelerating force.

Since two forces $P . dt$, and $d . \frac{dx}{dt}$, acting on the point M, keep it in equilibrium, then if the point be supposed to vary its position an infinitely small quantity δx, which may be here taken equal dx, according to the elementary theorem of La Place, each force multiplied into the element dx should equal zero; hence $dx \left\{ d . \frac{dx}{dt} - P . dt \right\} = o$.

And by integration $\frac{d^2 x}{dt^2} = C +$, twice the integral of $P . dx$. But $\frac{d^2 x}{dt^2}$ is the square of the velocity. Therefore the square of the velocity is always equal to twice the integral of the accelerating force multiplied into the element of the space; or according to our notation $v v = F . \dot{x}$; a theorem of extensive application in the doctrine of accelerating forces. This principle is analogous to that which, when extended to a system of bodies, is called the principle of the conservation of the *vis viva*.

In the above examples we may observe that the theorem of d'Alembert is not of itself sufficient to solve a problem, since it is always necessary to derive some condition relating to the equilibrium from other considerations. The difficulty of determining the forces, and the law of the equilibrium of these forces, renders this application sometimes more difficult, and the process more tedious, than if the solution were performed by some principle less simple and direct.

It was by combining the above principle of d'Alembert with that of virtual velocity, that La Grange was enabled to deduce the general equations relating to the forces which act on a system of bodies. He thus describes the nature of the method.

To form an accurate conception of the manner in which these principles are applied, we should recollect that the general principle of virtual velocity consists in this; that when a system of material points, solicited by any force, is in equilibrium, if the system receive a small alteration in its position, by virtue of which every point describes an infinitely small space, the sum of each force, multiplied by the space described by the point to which it is applied, according to the direction of the force, is always equal to zero.

If now we consider the system as in motion, and suppose the motion which every point has during an instant as composed of two, of which one is that which the point has the following instant, then it follows that the other must be destroyed by the reciprocal action of the points or bodies upon each other, and by that of the moving forces by which they are solicited. Thus there will be an equilibrium between these forces, and the pressures or resistances which result from the motions which are lost by the bodies from one instant to another. Hence it follows, that to extend to the motion of a system of bodies, the formulæ of its equilibrium, it is sufficient to add the terms due to these last-mentioned forces.

If now we consider the velocities which every particle has in the direction of three fixed rectangular co-ordinates, the decrement of these velocities will represent the motions lost in these directions, and their increments will be the motions lost in the opposite directions. Therefore the resulting pressures or forces of these motions destroyed will be expressed in general by the mass multiplied into the element of the velocity, and divided by the element of the time, and their directions will be directly opposite to those of the velocities.

By these means the terms required may be expressed analytically, and a general formula obtained for the motion of a system of bodies, which will comprehend the solution of all the problems in dynamics, and of which a simple expansion will give the necessary equations for each problem.

But one of the greatest advantages derived from the formula thus obtained is, that it gives directly a number of general

general equations, which contain the principles or theorems known under the appellations of the

Conſervation of the *vis viva*,
Conſervation of the motion of the centre of gravity,
Conſervation of equal areas,
And the principle of the leaſt action.

The firſt of theſe principles, the conſervation of the *vis viva*, was diſcovered by Huygens, but under a form ſomewhat different to that which we now give it. The principle, as employed by him, conſiſted in the equality between the aſcent and deſcent of the centre of gravity of ſeveral ponderable bodies which deſcend conjointly, and afterwards aſcend ſeparately by the velocity each had acquired. Now by the known properties of the centre of gravity, the ſpace deſcribed by it in any direction is expreſſed by the ſum of the products of the maſs of each body, by the ſpace it has deſcribed in the ſame direction, divided by the ſum of the maſſes. On the other hand, by the theorems of Galileo, the vertical ſpace deſcribed by a heavy body in its deſcent is proportional to the ſquare of the velocity acquired, and with which it will aſcend to the ſame height: thus the principle of Huygens is reduced to this, that in the motion of a ſyſtem of bodies, the ſum of the maſſes by the ſquares of the velocities at every inſtant is the ſame, whether the bodies have deſcended conjointly in any manner whatever, or have each deſcended freely through the ſame vertical heights. Hitherto this principle had only been regarded as a ſimple theorem of mechanics; but when J. Bernouilli had adopted the diſtinction eſtabliſhed by Leibnitz, between the preſſures which act without producing actual motion, and the living forces, as they were termed, which produced motion, as likewiſe the meaſure of theſe forces by the products of the maſſes by the ſquares of the velocities, he ſaw nothing in the principle in queſtion but a conſequence of the theory of the *vis viva*, and a general law of nature; in conſequence of which the ſum of the *vis viva* of ſeveral bodies preſerves itſelf the ſame as long as they act on each other by ſimple preſſures, and is always equal to the ſimple *vis viva* reſulting from the action of the actual forces which move the body. He gave it the name of the "conſervatio virium vivarum," and employed it with ſucceſs in the ſolution of ſeveral problems that before him had not been effected.

His ſon, the celebrated D. Bernouilli, afterwards deduced from this principle the law of the motion of fluids in vaſes, a ſubject which before had only been treated in a vague and unſatisfactory manner. In the Berlin memoirs for 1748, he explained and rendered this principle very general, ſhewing how it might be applied to the motion of bodies ſolicited by mutual attraction, or drawn towards fixed centres by forces proportional to any function of the diſtance whatever.

The advantage of this principle conſiſts in its affording immediately an equation between the velocities of the bodies and the variable quantities which determine their poſition in ſpace, ſo that when by the nature of the problem theſe variable quantities are reduced to one, this equation alone is ſufficient for its ſolution, which is the caſe in that relating to the centre of oſcillation. In general the conſervation of the *vis viva* gives always a firſt integral of the different differential equations of each problem, which is often of great utility.

The ſecond principle is that of Newton, given as an elementary propoſition in his "Principia." He demonſtrates, that the ſtate of repoſe or motion of the centre of gravity of ſeveral bodies, is not altered by the reciprocal action of theſe bodies in any manner whatever; ſo that the centre of gravity of bodies which act upon each other either by cords or levers, or by the laws of attraction, independent of any exterior action or obſtacle, remains always in repoſe, or moves uniformly in a ſtraight line.

D'Alembert has extended this theorem, and ſhewn that if every body of the ſyſtem is ſolicited by a conſtant accelerating force acting either in parallel lines or directed towards a fixed point, and varying with the diſtance, the centre of gravity will deſcribe the ſame curve as if the bodies were free; and it might be added, that the motion of this centre will be the ſame as if all the forces of the bodies were applied to it each in its proper direction.

It is evident that this principle ſerves to determine the motion of the centre of gravity, independently of the reſpective motions of the bodies, and thus it will always afford three finite equations between the co-ordinates of the bodies and the times, and which will be the integrals of the differential equations of the problem.

The third principle is much leſs ancient than the two preceding, and appears to have been diſcovered about the ſame time by Euler, Bernouilli, and the chevalier d'Arcy, but under different forms.

According to the two firſt, the principle conſiſts in this, that in the motion of ſeveral bodies about a fixed centre, the ſum of the products of the maſs of each body, by the velocity of rotation round the centre, and by its diſtance from the ſame centre, is always independent of any mutual action which the bodies may exert upon each other, and preſerves itſelf the ſame as long as there is no exterior action or obſtacle. Daniel Bernouilli gave this principle in the firſt volume of the Memoirs of the Academy of Berlin, in 1746, and d'Alembert the ſame year, in his "Opuſcula." The principle of M. d'Arcy, as given to the Academy of Paris in 1746, but not printed till 1752, is, that the ſum of the products of the maſs of each body, by the area traced by its radius vector about a fixed point, is always proportional to the times. This principle is nothing more than a generalization of the beautiful theorem of Newton, of the equality of areas deſcribed by centripetal forces, and to perceive the analogy, or rather identity, with that of Euler and Bernouilli, it is ſufficient to recollect that the velocity of rotation is expreſſed by the element of the circular arc divided by the element of the time, and that the firſt of theſe elements multiplied by the diſtance from the centre, gives the element of the area deſcribed about this centre; ſo that this laſt principle is only the differential expreſſion of that of M. d'Arcy. This author afterwards gave this principle another form, which renders it more ſimilar to the preceding. The ſum of the products of the maſſes by the velocities, and by the perpendiculars drawn from the centre to the direction of the forces, is always a conſtant quantity.

Under this point of view he eſtabliſhed a ſpecies of metaphyſical principle, which he calls the conſervation of action, to oppoſe, or rather ſubſtitute it for, the principle of the leaſt action, as if theſe vague and arbitrary denominations could conſtitute the eſſence of the laws of nature, or by ſome ſecret virtue could raiſe ſimple reſults of the known laws of mechanics to the rank of final cauſes.

But however this may be, the principle in queſtion takes place in every ſyſtem of bodies which act on each other in any manner whatever, whether by cords, inflexible lines, attractions, &c. and moreover ſolicited by forces directed to a centre; and this, whether the ſyſtem be entirely free, or conſtrained to move about this centre. The ſum of the products of the maſſes by the areas deſcribed about this centre, and projected on any plane whatever, is always proportional to the time; ſo that referring theſe areas to three rectangular

rectangular planes, three differential equations are obtained of the first order between the time and the co-ordinates of the curves described by the bodies; and it is, properly, in these equations that the nature of the principle exists.

The fourth principle is that of the least action, so called by Maupertuis, and which the writings of several illustrious authors have since rendered celebrated. Considered analytically the principle is this, that in the motion of bodies which act one upon the other, the sum of the products of the masses by the velocities, and by the spaces described, is a minimum. The author has deduced from it the laws of reflection and refraction of light, as likewise those of the shock of bodies, in two memoirs, one of the Academy of Sciences for 1744, the other two years afterwards, in those of Berlin.

But it must be confessed, that these applications are too partial to establish the truth of a general principle, and, besides, have something in them too vague and arbitrary, which renders the consequences uncertain as to the exactness of the principle itself: so that this principle ought not to be classed with those above explained. But there is another point of view in which it may be considered more general and exact, and which alone merits the attention of geometricians. Euler gave the first idea at the end of his treatise on Isoperimetrical problems printed at Lausanne in 1744, shewing that in trajectories described by central forces, the integral of the velocity multiplied by the element of the curve is always a maximum or a minimum.

This property, as explained above, was only known by Euler to belong to insulated bodies; La Grange extended it afterwards to the motion of bodies which act on each other in any manner whatever. And there results this new general principle, that the sum of the products of the masses by the integrals of the velocities, multiplied by the elements of the spaces described, is constantly a maximum or a minimum.

By combining this principle with that of the conservation of the *vis viva*, a solution of many difficult problems in dynamics may be obtained. Examples are to be found by La Grange in the second volume of the Memoirs of the Academy of Turin.

Such is the general outline of the history and nature of the principles of dynamics, as given by La Grange. The subject is treated much in the same manner by La Place in the "Mechanique Celeste," but the investigation is carried still further. With La Grange he adopts the principle of d'Alembert, and resolves every motion into two, one which the particle had in the preceding instant, and the other such as would have sustained it in equilibrio.

La Place, however, differs from La Grange in not admitting the principle of virtual velocity to be assumed as a fundamental axiom, but demonstrates it by a regular train of inductions; having established nearly the same formulæ or differential equations, and deduced all the above general principles in the manner already described.

In addition to these principles others, in the nature of corollaries, are introduced, many of which are very deserving of attention. From the principle of the conservation of areas it follows, that in the motion of a system of bodies solicited only by their mutual attraction, and by forces directed to the origin of the co-ordinates, there exists a plane passing through this origin, and which possesses these remarkable properties. 1. That the sum of the areas, traced on this plane by the projections of the radii vectores of the bodies, and multiplied by their respective masses, will be the greatest possible. 2. That this same sum is equal to zero upon all the planes perpendicular to it. As the principle of the *vis viva*, and of areas subsists relatively to the centre of gravity, even supposing it to have a rectilinear and uniform motion; it follows, that a plane may be determined passing through this moveable origin, on which the sum of the areas, described by the projections of the radii vectores, and multiplied respectively by their masses, may be the greatest possible. It appears, that this plane is parallel to that which passes through the fixed origin, and satisfies the same conditions: moreover, a plane passing through the centre of gravity, and determined according to the preceding conditions, remains always parallel to itself during the motion of the system, a circumstance of great importance and utility. It may be added, that any plane parallel to this, and passing through any one of the bodies, possesses analogous properties.

La Place proceeds to examine in what manner these results would be changed, by supposing other relations to subsist between the force and velocity. Force may be expressed in an infinite number of ways relatively to the velocity besides the simple law of proportionality, without implying any mathematical contradiction. If the force be supposed to be some other function of the velocity, (expressed analytically thus, $F = \phi\, v$) then the principle of the *vis viva* is found to obtain in all the relations mathematically possible between the force and velocity; the *vis viva* of a body being defined the product of its mass, by the double of the integral of its velocity, multiplied by the differential of the function of the velocity which expresses the force.

It is in the law of nature only, that the motion of the centre of gravity is preserved uniform and rectilinear.

The conservation of areas, likewise, would not subsist in any other law than in that of nature; but a principle, analogous to that of the least action, will be found to belong to every possible relation between force and velocity.

This principle of the least action is not so obvious as others we have mentioned, being much more remote from the elementary theorems from which they are all derived; but if it can be directly and mathematically deduced from the same simple principles, it can have no more claim to the dignity of a final cause than any other remarkable property of numbers, since the reverse would imply a mathematical contradiction. The fact, however, is curious, and deserving of attention; it may be analytically stated thus: suppose a material point, in consequence of the action of several forces, to move from one point to another, then the path or curve described is found to have this remarkable property, that the integral or continued product of the velocity (as determined by previous considerations) multiplied into the element of the curve, will be less than in any other curve passing through the same points. As this proposition can only be intelligible to those who are in some degree familiar with the language of the differential calculus, we shall endeavour to illustrate it by taking a particular case as an example. Let us suppose the point M (*fig.* 2.) projected horizontally in the direction M *s*, and at the same time attracted by the force of gravity in the direction M S; its path, as is well known, will be the parabola M M′. At any point *m*, if *x* be assumed to express the distance M *m′*, the velocity at that point, *m*, will be expressed by $\sqrt{h + x}$; *h* being some constant quantity previously determined, and in this instance depending on the force of gravity and on the force of projection. Now, if we conceive the curve M M′ to be divided into an infinite number of small portions or elements, and that each of these be multiplied by the expression $\sqrt{h + x}$, which denotes the velocity, and which will have a different value for every element into which it is to be multiplied, then it is asserted, that the sum of all these small factors, (or what in the language of analysis is called their *integral*) will be less than if the same operation had

general equations, which contain the principles or theorems known under the appellations of the

Confervation of the *vis viva*,
Confervation of the motion of the centre of gravity,
Confervation of equal areas,
And the principle of the leaft action.

The firft of thefe principles, the confervation of the *vis viva*, was difcovered by Huygens, but under a form fomewhat different to that which we now give it. The principle, as employed by him, confifted in the equality between the afcent and defcent of the centre of gravity of feveral ponderable bodies which defcend conjointly, and afterwards afcend feparately by the velocity each had acquired. Now by the known properties of the centre of gravity, the fpace defcribed by it in any direction is expreffed by the fum of the products of the mafs of each body, by the fpace it has defcribed in the fame direction, divided by the fum of the maffes. On the other hand, by the theorems of Galileo, the vertical fpace defcribed by a heavy body in its defcent is proportional to the fquare of the velocity acquired, and with which it will afcend to the fame height: thus the principle of Huygens is reduced to this, that in the motion of a fyftem of bodies, the fum of the maffes by the fquares of the velocities at every inftant is the fame, whether the bodies have defcended conjointly in any manner whatever, or have each defcended freely through the fame vertical heights. Hitherto this principle had only been regarded as a fimple theorem of mechanics; but when J. Bernouilli had adopted the diftinction eftablifhed by Leibnitz, between the preffures which act without producing actual motion, and the living forces, as they were termed, which produced motion, as likewife the meafure of thefe forces by the products of the maffes by the fquares of the velocities, he faw nothing in the principle in queftion but a confequence of the theory of the *vis viva*, and a general law of nature; in confequence of which the fum of the *vis viva* of feveral bodies preferves itfelf the fame as long as they act on each other by fimple preffures, and is always equal to the fimple *vis viva* refulting from the action of the actual forces which move the body. He gave it the name of the "confervatio virium vivarum," and employed it with fuccefs in the folution of feveral problems that before him had not been effected.

His fon, the celebrated D. Bernouilli, afterwards deduced from this principle the law of the motion of fluids in vafes, a fubject which before had only been treated in a vague and unfatisfactory manner. In the Berlin memoirs for 1748, he explained and rendered this principle very general, fhewing how it might be applied to the motion of bodies folicited by mutual attraction, or drawn towards fixed centres by forces proportional to any function of the diftance whatever.

The advantage of this principle confifts in its affording immediately an equation between the velocities of the bodies and the variable quantities which determine their pofition in fpace, fo that when by the nature of the problem thefe variable quantities are reduced to one, this equation alone is fufficient for its folution, which is the cafe in that relating to the centre of ofcillation. In general the confervation of the *vis viva* gives always a firft integral of the different differential equations of each problem, which is often of great utility.

The fecond principle is that of Newton, given as an elementary propofition in his "Principia." He demonftrates, that the ftate of repofe or motion of the centre of gravity of feveral bodies, is not altered by the reciprocal action of thefe bodies in any manner whatever; fo that the centre of gravity of bodies which act upon each other either by cords or levers, or by the laws of attraction, independent of any exterior action or obftacle, remains always in repofe, or moves uniformly in a ftraight line.

D'Alembert has extended this theorem, and fhewn that if every body of the fyftem is folicited by a conftant accelerating force acting either in parallel lines or directed towards a fixed point, and varying with the diftance, the centre of gravity will defcribe the fame curve as if the bodies were free; and it might be added, that the motion of this centre will be the fame as if all the forces of the bodies were applied to it each in its proper direction.

It is evident that this principle ferves to determine the motion of the centre of gravity, independently of the refpective motions of the bodies, and thus it will always afford three finite equations between the co-ordinates of the bodies and the times, and which will be the integrals of the differential equations of the problem.

The third principle is much lefs ancient than the two preceding, and appears to have been difcovered about the fame time by Euler, Bernouilli, and the chevalier d'Arcy, but under different forms.

According to the two firft, the principle confifts in this, that in the motion of feveral bodies about a fixed centre, the fum of the products of the mafs of each body, by the velocity of rotation round the centre, and by its diftance from the fame centre, is always independent of any mutual action which the bodies may exert upon each other, and preferves itfelf the fame as long as there is no exterior action or obftacle. Daniel Bernouilli gave this principle in the firft volume of the Memoirs of the Academy of Berlin, in 1746, and d'Alembert the fame year, in his "Opufcula." The principle of M. d'Arcy, as given to the Academy of Paris in 1746, but not printed till 1752, is, that the fum of the products of the mafs of each body, by the area traced by its radius vector about a fixed point, is always proportional to the times. This principle is nothing more than a generalization of the beautiful theorem of Newton, of the equality of areas defcribed by centripetal forces, and to perceive the analogy, or rather identity, with that of Euler and Bernouilli, it is fufficient to recollect that the velocity of rotation is expreffed by the element of the circular arc divided by the element of the time, and that the firft of thefe elements multiplied by the diftance from the centre, gives the element of the area defcribed about this centre; fo that this laft principle is only the differential expreffion of that of M. d'Arcy. This author afterwards gave this principle another form, which renders it more fimilar to the preceding. The fum of the products of the maffes by the velocities, and by the perpendiculars drawn from the centre to the direction of the forces, is always a conftant quantity.

Under this point of view he eftablifhed a fpecies of metaphyfical principle, which he calls the confervation of action, to oppofe, or rather fubftitute it for, the principle of the leaft action, as if thefe vague and arbitrary denominations could conftitute the effence of the laws of nature, or by fome fecret virtue could raife fimple refults of the known laws of mechanics to the rank of final caufes.

But however this may be, the principle in queftion takes place in every fyftem of bodies which act on each other in any manner whatever, whether by cords, inflexible lines, attractions, &c. and moreover folicited by forces directed to a centre; and this, whether the fyftem be entirely free, or conftrained to move about this centre. The fum of the products of the maffes by the areas defcribed about this centre, and projected on any plane whatever, is always proportional to the time; fo that referring thefe areas to three rectangular

rectangular planes, three differential equations are obtained of the first order between the time and the co-ordinates of the curves described by the bodies; and it is, properly, in these equations that the nature of the principle exists.

The fourth principle is that of the least action, so called by Maupertuis, and which the writings of several illustrious authors have since rendered celebrated. Considered analytically the principle is this, that in the motion of bodies which act one upon the other, the sum of the products of the masses by the velocities, and by the spaces described, is a minimum. The author has deduced from it the laws of reflection and refraction of light, as likewise those of the shock of bodies, in two memoirs, one of the Academy of Sciences for 1744, the other two years afterwards, in those of Berlin.

But it must be confessed, that these applications are too partial to establish the truth of a general principle, and, besides, have something in them too vague and arbitrary, which renders the consequences uncertain as to the exactness of the principle itself: so that this principle ought not to be classed with those above explained. But there is another point of view in which it may be considered more general and exact, and which alone merits the attention of geometricians. Euler gave the first idea at the end of his treatise on Isoperimetrical problems printed at Lausanne in 1744, shewing that in trajectories described by central forces, the integral of the velocity multiplied by the element of the curve is always a maximum or a minimum.

This property, as explained above, was only known by Euler to belong to insulated bodies; La Grange extended it afterwards to the motion of bodies which act on each other in any manner whatever. And there results this new general principle, that the sum of the products of the masses by the integrals of the velocities, multiplied by the elements of the spaces described, is constantly a maximum or a minimum.

By combining this principle with that of the conservation of the *vis viva*, a solution of many difficult problems in dynamics may be obtained. Examples are to be found by La Grange in the second volume of the Memoirs of the Academy of Turin.

Such is the general outline of the history and nature of the principles of dynamics, as given by La Grange. The subject is treated much in the same manner by La Place in the "Mechanique Celeste," but the investigation is carried still further. With La Grange he adopts the principle of d'Alembert, and resolves every motion into two, one which the particle had in the preceding instant, and the other such as would have sustained it in equilibrio.

La Place, however, differs from La Grange in not admitting the principle of virtual velocity to be assumed as a fundamental axiom, but demonstrates it by a regular train of inductions; having established nearly the same formulæ or differential equations, and deduced all the above general principles in the manner already described.

In addition to these principles others, in the nature of corollaries, are introduced, many of which are very deserving of attention. From the principle of the conservation of areas it follows, that in the motion of a system of bodies solicited only by their mutual attraction, and by forces directed to the origin of the co-ordinates, there exists a plane passing through this origin, and which possesses these remarkable properties. 1. That the sum of the areas, traced on this plane by the projections of the radii vectores of the bodies, and multiplied by their respective masses, will be the greatest possible. 2. That this same sum is equal to zero upon all the planes perpendicular to it. As the principle of the *vis viva*, and of areas subsists relatively to the centre of gravity, even supposing it to have a rectilinear and uniform motion; it follows, that a plane may be determined passing through this moveable origin, on which the sum of the areas, described by the projections of the radii vectores, and multiplied respectively by their masses, may be the greatest possible. It appears, that this plane is parallel to that which passes through the fixed origin, and satisfies the same conditions: moreover, a plane passing through the centre of gravity, and determined according to the preceding conditions, remains always parallel to itself during the motion of the system, a circumstance of great importance and utility. It may be added, that any plane parallel to this, and passing through any one of the bodies, possesses analogous properties.

La Place proceeds to examine in what manner these results would be changed, by supposing other relations to subsist between the force and velocity. Force may be expressed in an infinite number of ways relatively to the velocity besides the simple law of proportionality, without implying any mathematical contradiction. If the force be supposed to be some other function of the velocity, (expressed analytically thus, $F = \phi\ v$) then the principle of the *vis viva* is found to obtain in all the relations mathematically possible between the force and velocity; the *vis viva* of a body being defined the product of its mass, by the double of the integral of its velocity, multiplied by the differential of the function of the velocity which expresses the force.

It is in the law of nature only, that the motion of the centre of gravity is preserved uniform and rectilinear.

The conservation of areas, likewise, would not subsist in any other law than in that of nature; but a principle, analogous to that of the least action, will be found to belong to every possible relation between force and velocity.

This principle of the least action is not so obvious as others we have mentioned, being much more remote from the elementary theorems from which they are all derived; but if it can be directly and mathematically deduced from the same simple principles, it can have no more claim to the dignity of a final cause than any other remarkable property of numbers, since the reverse would imply a mathematical contradiction. The fact, however, is curious, and deserving of attention; it may be analytically stated thus: suppose a material point, in consequence of the action of several forces, to move from one point to another, then the path or curve described is found to have this remarkable property, that the integral or continued product of the velocity (as determined by previous considerations) multiplied into the element of the curve, will be less than in any other curve passing through the same points. As this proposition can only be intelligible to those who are in some degree familiar with the language of the differential calculus, we shall endeavour to illustrate it by taking a particular case as an example. Let us suppose the point M (*fig.* 2.) projected horizontally in the direction M s, and at the same time attracted by the force of gravity in the direction M S; its path, as is well known, will be the parabola M M′. At any point m, if x be assumed to express the distance M m', the velocity at that point, m, will be expressed by $\sqrt{h+x}$; h being some constant quantity previously determined, and in this instance depending on the force of gravity and on the force of projection. Now, if we conceive the curve M M′ to be divided into an infinite number of small portions or elements, and that each of these be multiplied by the expression $\sqrt{h+x}$, which denotes the velocity, and which will have a different value for every element into which it is to be multiplied, then it is asserted, that the sum of all these small factors, (or what in the language of analysis is called their *integral*) will be less than if the same operation had

had been performed on any other line or curve paffing through M M′. It may appear, at firft fight, that the fum of thefe factors would have been lefs had the body moved from M to M′ by the fhorteft path, or in the ftraight line M M′. Let us examine this cafe, and fee whether we fhould, by this fuppofition, inevitably obtain a lefs product than by the former one. If we divide the line into the fame number of fmall elements as the curve, it is evident that each of thefe will be fmaller, and fo far our object being to obtain a minimum, the advantage is in favour of the ftraight line; but if we examine the multipliers $\sqrt{h+x}$, we fhall find that they increafe rapidly in value as they defcend, and if we confider the figure, we may obferve that in the ftraight line half the elements are multiplied by greater values of $\sqrt{h+x}$. Now this effect is obviated by the curve, as the greater number of its elements are placed in the upper part of the figure, where the multipliers $\sqrt{h+x}$ are comparatively but of fmall value. Were the curve however to be made too convex, as the dotted line in the figure, this advantage might be deftroyed by the increafed value of the elements, which might more than counterbalance the effect of the diminifhed values of $\sqrt{h+x}$. It will not be difficult now to comprehend the exiftence of fome curve, in which the fum of the factors thus determined fhall be lefs than in any other. In the prefent cafe it is found to be a parabola, and in every inftance it can be fhewn, that the curve anfwering to the above conditions of a minimum, is identical with that which a body is known to defcribe by the ufual rules of mechanical inveftigation. Admitting, therefore, the principle of the leaft action as an eftablifhed theorem, problems may be folved by it, and the trajectories of bodies moving in fpace determined; but it is of very little practical utility, fince the neceffary calculations are much more complex and difficult than the more ufual methods of inveftigation. The reader will find fome inftances of thefe folutions under the article of *Analytic* FUNCTION. See likewife ISOPERIMETRICAL *Problems*.

The above explanation refers only to the cafe of a fingle body, nor did Maupertuis, the inventor of this principle, extend it farther. Euler eftablifhes the generality of this principle in his treatife on the Ifoperimetrical problems, and fhews that in all trajectories defcribed by the action of centripetal forces, the integral of the velocity, multiplied by the element of the curve, is always a maximum or a minimum. La Grange firft extended this principle to a fyftem of bodies, acting on each other, and demonftrated, that the fum of the products of the maffes by the integrals of the velocities, multiplied by the elements of the fpaces defcribed, is always either a maximum or a minimum.

Thefe are the great and leading principles of the doctrine of forces, which have been at different times excogitated by the moft eminent writers on thefe fubjects; moft of them are nothing more than developements of theorems eafily derived from the Newtonian laws of motion, and many of them eftablifhed indeed by Newton himfelf; but there is a great advantage in this generalization of mechanical principles, as it enables us to take a more enlarged and comprehenfive view of the fubject, than when the attention is confined to the detail of a fingle problem.

Forces, which become the fubject of mathematical computation, may very properly be divided into three feparate claffes.

1ft. Thofe which, acting inftantaneoufly, or at leaft for a fhort interval of time, impart uniform motion to a particle on which they act, provided it be not folicited by any other force, and at the fame time free to move in any direction.

2d. Forces which act conftantly, and whofe intenfity remains the fame: a material particle, free to obey the action of fuch a force, defcribes its path with a motion *uniformly accelerated*.

3d. Forces whofe intenfities are continually varying, but according to fome known law. The motion produced by the action of thefe forces is very complicated, and the circumftances relating to it can only be inveftigated by means of the integral calculus, or by fome analogous methods.

Every force, whofe mode of action is too arbitrary and uncertain to be included in either of the above claffes, may be confidered as in great meafure foreign to the prefent fubject of inveftigation.

Cafe 1. When the forces meet in the fame point.

When feveral forces, as P, Q, S, &c. (*fig.* 3.) whofe directions are M P, M Q, M S, and intenfities M *a*, M *b*, M *c*, are exerted on any point M, the refulting force is eafily obtained, by combining the forces by parallelograms two and two, till a final refulting force is obtained, which in this cafe, as appears by the figure, is in the direction M R, and whofe magnitude is the diagonal M *d*. This procefs may be fimplified by taking M *a* (*fig.* 4.) equal and parallel to any force P, *a b* equal and parallel to any force Q, *b c* to a force S, &c. then M *c* fhall be the refulting force. If the forces terminate in M, after being carried round in a polygon, it would indicate that the point M was in equilibrium; and it is evident that if for the refulting force we fubftitute its equal, in a contrary direction, the point M will likewife be in equilibrium.

Neither of thefe methods are of great practical utility, though extremely well adapted to illuftrate the principle on which forces are eftimated; we are therefore to confider by what mode they may moft commodioufly be introduced into analytic calculation.

Let the angle P M R (*fig.* 5.) $= \theta$, Q M R $= \epsilon$, M $a\,d = \alpha$, then

$$\begin{aligned} P : Q &:: \text{fin. } \epsilon : \text{fin. } \theta \\ P : R &:: \text{fin. } \epsilon : \text{fin. } \alpha \\ Q : R &:: \text{fin. } \theta : \text{fin. } \alpha. \end{aligned}$$

$$\text{Therefore } \frac{P}{\text{fin. } \epsilon} = \frac{Q}{\text{fin. } \theta} = \frac{R}{\text{fin. } \alpha}.$$

Hence three forces are in equilibrio, when each is proportional to the fine of the angle formed by the direction of the two others. Since the direction of the refulting force depends only on the ratio, and not on the abfolute magnitude of the producing forces, it follows that if feveral forces are in equilibrium, and they are made to vary proportionally, they will ftill remain in equilibrium.

If $P = Q$; $\epsilon = \theta$; and $R = 2\,P \cos. \theta$

If the direction of the forces P, Q, are at right angles.

$$\begin{aligned} \text{Then } R^2 &= P^2 + Q^2 \\ \text{And } P &= R \cos. \theta \\ Q &= R \text{ fin. } \theta \\ Q &= P \,.\, \text{tang } \theta. \end{aligned}$$

Thefe equations are often of great utility in transforming forces into others that are rectangular. For to refolve any force R into two others which fhall be rectangular, it is fufficient to obferve that $P = R \cos. \theta$, $Q = R \text{ fin. } \theta$, or that each producing force is the product of the refulting force R, by the cofine of the angle which it makes with this producing force.

Hitherto we have fuppofed the forces to act in one plane. Suppofe now three forces P, Q, S, acting on the point M in directions not in the fame plane, and firft let thefe directions be rectangular, that is, let P and S be at right angles, and Q perpendicular to their plane. The producing forces P and S, the refulting force T, determined by the equations $P = T \cos. \theta$; $S = T \text{ fin. } \theta$, where θ is the angle formed by T and P. In the fame manner Q and T have their refulting

ing force R, given by the equations R $\sin. \gamma = T$; R $\cos. \gamma = Q$; γ being the angle formed by R and Q. Substituting R $\sin. \gamma$ for T in the two first equations, we have $P = R \cos. \theta . \sin. \gamma$; $S = R \sin. \theta . \sin. \gamma$; $Q = R \cos. \gamma$.

The sum of the squares of these equations gives $R^2 = P^2 + Q^2 + S^2$. The values of θ and γ are easily found, which compleat the problem. It is more convenient to employ the angles α, β, and γ, which the direction of the resulting force R forms with the respective forces P, S, and Q. Now it is known that $\cos. \theta . \sin. \gamma = \cos. \alpha$; and $\sin. \theta . \sin. \gamma = \cos. \beta$. Therefore, instead of the preceding equations, we have $P = R \cos. \alpha$; $S = R \cos. \beta$; $Q = R \cos. \gamma$; from whence α, β, γ, are obtained.

General case in which the forces are supposed to have any directions whatever in space.—Let A S, A P, A Q, (*fig.* 6.) be three rectangular co-ordinates passing through any arbitrary point A: let A P be the axis of x, A S that of y, and A Q of z. The plane P A S will be the plane of $x y$ (see *Analytic* GEOMETRY), S A Q that of $y z$, and P A Q that of $x z$. Of these axes two, as x, y, may be supposed horizontal, and z vertical.

Let the forces be represented by P', P'', P''', &c. whose directions form with the axis of

$$\begin{array}{lll} x & \text{the angles} & \alpha', \alpha'', \alpha''' \\ y & - \quad - & \beta', \beta'', \beta''' \\ z & - \quad - & \gamma', \gamma'', \gamma'''. \end{array}$$

By resolving each of these forces into three others, whose directions are parallel to the axes, we have for the producing forces parallel to the axes

$$\begin{array}{ll} x & P'. \cos. \alpha', P''. \cos. \alpha'', P'''. \cos. \alpha''' \\ y & P' \cos. \beta', P'' \cos. \beta'', P''' \cos. \beta''' \\ z & P' \cos. \gamma', P'' \cos. \gamma'', P''' \cos. \gamma''' \end{array}$$

Each of these collections of forces are equivalent to a single force, equal to their sum. Since they are in the direction of the same straight line, let X, Y, Z, be the three forces parallel to the respective axes, and we have

$$X = P' \cos. \alpha' + P'' \cos. \alpha'' + P''' \cos. \alpha'''$$
$$Y = P' \cos. \beta' + P'' \cos. \beta'' + P''' \cos. \beta'''$$
$$Z = P' \cos. \gamma' + P'' \cos. \gamma'' + P''' \cos. \gamma'''$$

Let α, β, γ, be the unknown angles which the resulting force R forms with the three axes; then R $\cos. \alpha$, R $\cos. \beta$, R $\cos. \gamma$, will be the equivalent producing forces in the directions of x, y, z; hence R $\cos. \alpha = X$, R $\cos. \beta = Y$, R. $\cos. \gamma = Z$.

To obtain the value of R and its direction, add together the squares of these equations, and $R^2 (\cos.^2 \alpha + \cos.^2 \beta + \cos.^2 \gamma) = X^2 + Y^2 + Z^2$, but $\cos.^2 \alpha + \cos.^2 \beta + \cos.^2 \gamma = 1$: therefore

$$R = \sqrt{(X^2 + Y^2 + Z^2)} \text{ and}$$
$$\cos. \alpha = \frac{X}{R}, \cos. \beta = \frac{Y}{R}, \cos. \gamma = \frac{Z}{R}.$$

which equations indicate that the resulting force is the diagonal of a parallelopiped, whose three edges are X, Y, and Z.

Let now x', y', z', be the co-ordinates of the point to which these forces are applied, the projections of the resulting force upon the three co-ordinate planes will pass through that of the point. The equations of the projections of this line will therefore be

$$\begin{array}{ll} y - y' = a\,(x - x') & \text{upon the axis of } x y \\ z - z' = b\,(x - x') & x z \\ b\,(y - y') = a\,(z - z') & y z \end{array}$$

a and b being the tangents of the angles which the axis of x forms with these projections on the planes of $x y$ and $x z$. If, therefore, through the point A, the lines A P, A S, A Q, be drawn parallel to the axes x, y, z, the projection for the resulting force R, on the plane P A S, will be A T; therefore, the tangent a of the angle $TAP = \theta$,

$$\text{or } \tan g. \theta = \frac{Y}{X} = a.$$

In the same manner $\frac{Z}{X} = b$.

The equations of the projections are therefore

$$\left.\begin{array}{l} X\,(y - y') = Y\,(x - x') \\ Y\,(z - z') = Z\,(x - x') \\ Z\,(y - y') = Y\,(z - z') \end{array}\right\}$$

If the system be in equilibrium,

$$X = o, \; Y = o, \; Z = o.$$

On parallel forces.—Previously to the consideration of parallel forces, it will be necessary to notice a very simple geometrical proposition, and which forms, in fact, the basis of what La Place and other French writers call the "Theorie des Moments." The terms momentum and moment have been used by different authors to express very different ideas. It is often used to express the effort, action, energy, or impetus of a power to communicate motion to a body or system of bodies; but modern writers, particularly the mathematicians of the continent, understand by moment the product of a power or force multiplied by the distance of its direction from a given point, line, or plane.

If a point E, (*fig.* 7.) be taken any how situated with respect to the parallelogram A B C D, and the perpendiculars E F, E G, E H, be drawn from E to the two sides, and to the diagonal, $AD \times EG$ will be equal to $AC \times EH + AB \times EF$. Join E A, E B, E D. Produce D B to I; $IH = DL$ will be the height of the triangle A C D, A C being the base.

$$\triangle EAD = \frac{AD \times EG}{2}$$

$$\triangle EAB = \frac{AB \times EF}{2}$$

$$\triangle ABD = ACD = \frac{AC \times IH}{2}$$

$$\triangle EBD = \frac{BD \times EI}{2} = \frac{AC \times EI}{2}$$

$$EAD = \frac{AD \times EG}{2} = \frac{AB \times EF}{2} + \frac{AC \times IH}{2} + \frac{AC \times EI}{2}$$

$$AD \times EG = AB \times EF + AC \times EH.$$

Or, $R \times EG = P \times EF + Q \times EH$.

If the point E be taken within the parallelogram, then $R \times EG = P \times EF - Q \times EH$.

The force P, multiplied by the distance E F, is called the moment of the force P relatively to the point E; hence by the preceding proposition it appears that, according to this definition, the moments of the producing forces are equal to the moment of the resulting forces; and in case of equilibrium, the sum of the moments of all the forces are equal to zero.

If the point E be taken in the direction of one of the producing forces, as P, then $EF = o$;

$$R \times EG = Q = EH$$
$$R : Q :: EH : EG.$$

If E be taken in the direction of the resulting forces $EG = o$, and $P \times EF = Q \times EH$, hence

$$P : Q :: EH : EF.$$

This proposition, which is quite independent of any idea of motion, rotation, or force, may be deduced generally, by means of the analytic equations already demonstrated for finding the resulting force, from any number of producing forces soliciting a point; but the property being entirely geometrical, that form for the demonstration has been preferred.

ferred. The above propofition is a very important one in the general equations of equilibrium. The fame propofition may be extended to parallel forces, by fuppofing the point A to recede to an infinite diftance by the revolutions of A P, A Q, round any two points M, N; then the figure will take the form as defcribed in (*fig.* 7). And fince

$$P \times EF = Q \times EH$$
$$R \times EG = Q \times EH$$
$$P : Q :: EH : EF$$
$$R : Q :: EH : EG$$

Corol. fince $P : GH :: Q : EF :: R : FH$

$$P + Q : GH + EF :: R : FH$$
$$\text{And } P + Q = R.$$

and $P - Q = R$, when they act in oppofite directions.

Or the fame propofition may be demonftrated thus, without the neceffity of confidering the point as removed to an infinite diftance.

Let two parallel forces, p and q, (*fig.* 8.) acting in the fame direction, be applied to the two extremities E, F, of the line E F, to which they are perpendicular; then fuppofe two new forces p', q', applied at the extremities E, F, in oppofite directions; p' being equal to q'. It is evident thefe forces will not tend to alter the ftate of the fyftem, being equal and oppofite: refolve p' and p, q' and q, into P and Q, and let thefe forces produced meet in A. Through A draw B C parallel to E F, and A O perpendicular to it. Decompofe the forces P and Q according to the directions A B, A O, and A C, A O; the firft will be p' and p, the fecond q and q', fince the circumftances of this are the fame at A as E and F; the two forces q' and p' deftroy each other; the refulting force acting in the direction A O is therefore $p + q$. Since P is the refulting force of two rectangular forces p and p', the tangent of the angle $PEp' = \frac{p}{p'} = \frac{AO}{EO}$; hence $p' = p \cdot \frac{EO}{AO}$; in the fame manner $q' = q \cdot \frac{OF}{OA}$; therefore $p \times EO = q \times OF$, which is the known principle of the lever.

If the two parallel forces P and Q are oblique to the line of application E G, and if their refulting force be R, then draw B D perpendicular to the force, and fuppofe B, C, D, the points of application; and fince $P \times BC = Q \times CD$, and E F and F G are proportional to B C, C D; $P \times EF = Q \times FG$, which fhews that the preceding propofition does not require the direction of the forces to be perpendicular to the line of application. Therefore, in general, the refulting force of two parallel forces is equal to their fum and parallel to them, and divides the line to which they are applied in two parts, reciprocally proportional to thefe forces:

If $EG = a$, $EF = p$, $FG = q$
$a = p + q$, $R = P + Q$, $Pp = Qq$.

of which fix quantities, three being given, the remainder may be found.

Let us next confider the effect of any fyftem of parallel forces P', P'', P''', acting on different points of any body whatever: let x', y', z', x'', y'', z'', be the refpective co-ordinates of thefe points to the three rectangular planes; let D, K, (*fig.* 9.) be the points of application of the forces P', P'', and G that of their refulting force R, and let a', b', c', be the three co-ordinates of G; then

$$AB = x', \quad BC = y', \quad CD = z'$$
$$AH = x'', \quad HI = y'', \quad IK = z'$$
$$AE = a', \quad EF = b', \quad FG = c'$$

$R' = P' + P''$, and if D K be produced till it meets the plane of xy in L; $R' \times LG = P' \times LD + P'' \times LK$; and fince L G, L D, L K, are proportional to their projections $R'a' = P'x' + P''x''$, for the fame reafon

$$R'b' = P'y' + P''y'', \text{ and } R'c' = P'z' + P''z''.$$

In which equations great attention muft be paid to the figns which are neceffarily pofitive; they are fufficient to give both the magnitude and direction of the refulting force.

This refulting force R' muft be taken with the next force P''' to obtain a new force, and this procefs continued till all the forces are combined; R' being fubftituted for P' and P'', and combined with P''', we have

$$R'' = R' + R''', \qquad R''a'' = R'a' + P'''x'''$$
$$R''b'' = R'b' + P'''y''', \quad R''c'' = R'c' + P'''z'''$$

fubftituting for R', $R'a'$, $R'b'$, $R'c'$ their values, the values of R'', $R''a''$, $R''b''$, $R''c''$ are obtained, and finally the refulting force R; and its direction is obtained in the following equations:

$$R = P' + P'' + \&c.$$
$$Rx = P'x' + P''x'' + \&c.$$
$$Ry = P'y' + P''y'' + \&c.$$
$$Rz = P'z' + P''z'' + \&c.$$

The firft equation gives the magnitude of the force; the co-ordinates x, y, z, of the point of application, are

$$\left.\begin{aligned} x &= \frac{P'x' + P''x'' + \&c.}{P' + P'' + \&c.} \\ y &= \frac{P'y' + P''y'' + \&c.}{P' + P'' + \&c.} \\ z &= \frac{P'z' + P''z'' + \&c.}{P' + P'' + \&c.} \end{aligned}\right\}$$

Thefe equations being independent of the direction of the forces, it is evident that the point which has x, y, z for its co-ordinates, will remain the fame, even when the forces take other parallel directions, provided that the points of application remain the fame; therefore there exifts a point through which the refulting force always paffes, when the forces turn round the point of their application. This point may be termed the *centre of parallel forces.*

It now only remains to inveftigate the general cafe, where any number of forces are fuppofed to act on a body in any directions whatever.

Firft, let the figure be fuppofed a plane, and the forces likewife fituated in the plane of the figure.

Let P', P'' &c., reprefent the forces; x', y', x'', y'', the co-ordinates of the points on which they act; α', α'', the angles which thefe co-ordinates make with the axis of x. Let P' be refolved into two forces X', Y', parallel to the axes x, y, and P'' into X'', Y'', &c. then

$$P' \cos.\alpha = X', \quad P'' \cos.\alpha'' = X'', \&c.$$
$$P' \sin.\alpha = Y', \quad P'' \sin.\alpha'' = Y'', \&c.$$

There will therefore be two collections of parallel forces, which may each be compofed into a fingle force. Let X be the fingle refulting force parallel to the axis x, and b its diftance from it, Y and a the force and diftance of the other parallel to the axis y; then

$$X = X' + X'' + \&c; \; Y = Y' + Y'' + \&c.$$
$$Xb = X'y' + X''y'' + \&c; \; Y'a = Y'x + Y''x'' + \&c$$

The forces X, Y, may now be combined into a fingle one, which will be applied in their point of interfection, whofe co-ordinates are a and b.

As the point of application of R may be taken in any part of its direction, it is neceffary to determine the equation of the ftraight line reprefenting this direction, fince it paffes

passes through two points, whose co-ordinates are a, b, its equation is $Y - b = \text{tang. } a (x - a)$; or since $\text{tang. } a = \frac{Y}{X}$, $X y - Y x = X b - Y a$, and by substitution for the values of $X b - Y a$, $X y - Y x = X' y' - Y' x' + X'' y'' - Y'' x'' + \&c.$

Here x and y are the co-ordinates of the point of application of the resulting force $X' y' - Y' x'$, the difference of the moments of the forces X', Y'; the same of the other forces: therefore, if p', p'', r, represent the perpendiculars let fall from the origin to the directions of the forces

$$X = X' + X'', \quad Y = Y' + Y''.$$

$$R r = P' p' + P'' p'' + \&c. \quad . \quad . \quad . \quad . \quad (m)$$

If π represent the sum of the moments, $R \cos. \alpha = X$, $R \sin. \alpha = Y$, $R r = \pi = X y - Y x$.

The conditions of equilibrium of this system are obtained by supposing it to exist, and then one of the forces P to be removed; the resulting force R may then be considered as $= - P$, and the equation $X y - Y x = \pi$, should be that of the force P. Hence by substitution the equations of equilibrium are obtained

$$\left.\begin{array}{l} X' + X'' + \&c. = o \\ Y' + Y'' + \&c. = o \\ P' p' + P'' p'' + \&c. = o \\ \text{or } X' Y' - Y' x' + X'' y'' - Y'' x'' + \&c. = o \end{array}\right\} (n)$$

In the same form are the terms of P, &c.

If the system be fixed by a point about which it may take a motion of rotation, the equilibrium may subsist without the forces destroying each other, provided the resulting force passes through the fixed point. If this point be the origin of the ordinates, $x = o, y = o$, and $\pi = o$; and $P' p' + P'' p'' + \&c. = o$.

If the equilibrium does not subsist, it may easily be established, by adding a force whose intensity and direction will be found by the above formulæ. It would be only necessary to introduce a new force P, which satisfies the equation (m); if p be its distance from the fixed point, P and p must be taken such, that $P p + P' p' + P'' p'' = o$, which problem is indeterminate as one of the quantities may be of any value whatever; some condition therefore may be added, as for instance, that the pressure on the fixed point may equal in quantity and direction some given force, &c.

Let us imagine a solid body situated in space, the respective points of which are solicited by any system of forces, whose intensity and directions are expressed by the same symbols or notation as before, but since the forces are not supposed to meet in any one point, the position of each must be determined by that of one of the points of its direction; for instance, the point of its application to the system; let $x', y', z', x'', y'', z''$, be the co-ordinates of these points of the forces P', P'', &c. Resolve each force at the point of its application into three others parallel to the axes of the rectangular co-ordinates; let X', Y', Z', be the three resolved forces of P'; X'', Y'', Z'', those of P'', &c. that is, let

$$P' \cos. \alpha' = X'; \quad P'' \cos. \alpha'' = X''$$
$$P' \cos. \beta' = Y'; \quad P'' \cos. \beta'' = Y''$$
$$P' \cos. \gamma' = Z'; \quad P' \cos. \gamma' = Z'.$$

Let a plane be imagined fixed in the solid body, and moveable with it; let this be the plane of $x y$, and suppose each force produced till it meet this plane; the equations of the straight line representing the force P' are $x - x' = A (z - z')$; $y - y = B (z - z')$; and, as above, $A = \frac{X'}{Z'}$, and $B = \frac{Y'}{Z'}$.

To obtain the point, where the point in which the line intersects the plane of $x y$, make $z = o$, which gives for the co-ordinates a', b', of this point

$$a' = \frac{Z' x' X' z'}{Z'}, \quad b' = \frac{Z' y' - X' z'}{Z'}.$$

And by changing the accents, analogous values are obtained for the other forces.

If every force be supposed to be applied at the point where its direction intersects the plane of $x y$, it may be resolved into two, one in the direction of the plane, and the other parallel to the axis z. Now the equilibrium cannot take place except it subsist separately in each of these collections of forces. The equations which express this state are thus attained.

The parallel forces to z should satisfy the three equations

$$P' + P'' + \&c. = o \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad .$$
$$P' x' + P'' x'' + \&c. = \text{tang. } \alpha \, (P' z' + P'' z'' + \&c.)$$
$$P' y' + P'' y'' + \&c. = \text{tang. } \beta \, (P' z' + P'' z'' + \&c.)$$

and as the force Z' is applied to a point, of which a' and b' are the co-ordinates, the moments of Z' are $Z' a'$ and $Z' b'$, or $Z' x' - X' z'$, and $Z' y' - Y' z'$.

In like manner are obtained those of Z''; hence

$$Z' + Z'' + \&c. = o$$
$$Z' x' - X' z' + Z'' x'' - X'' z'' + \&c. = o$$
$$Z' y' - Y' z' + Z'' y'' - Y'' z'' + \&c. = o.$$

The forces situated in the plane should also satisfy the three equations (n) of the last problem. To apply them, every force must be resolved into two others, parallel to x and y; P' into X', Y', and P'' into X'', Y'', and a', b', substituted for x', y', and $a'' b''$ for x'', y''.

The state of equilibrium, therefore, of a solid body, will be expressed by six equations.

$$\left.\begin{array}{l} X' + X'' + X''' + \&c. = o \\ Y' + Y'' + Y'' + \&c. = o \\ Z' + Z'' + Z''' + \&c. = o \end{array}\right\} (M)$$

$$\left.\begin{array}{l} X' y' - Y' x' + X'' y'' - Y'' x'' + \&c. = o \\ X' z' - Z' x' + X'' z'' - Z'' x'' + \&c. = o \\ Z' y' - Y' z' + Z'' y'' - Y'' z'' + \&c. = o \end{array}\right\} (N)$$

If the system contains a fixed point or fixed axis, it may be in equilibrium without the forces destroying each other; it would be sufficient for the resulting force to be directed to this axis or this point.

If the system is retained by a fixed axis, for instance that of z, it has no tendency to impress any motion on the body, and may therefore be neglected; it is sufficient that the forces that act in the plane of $x y$ be in equilibrium about their fixed origin. And we may conclude that a solid body is in equilibrium whenever the two collections of producing forces, which are in planes perpendicular to this axis, have the sum of their moments equal relatively to two rectangular planes passing through this axis.

If the system is retained by a single point (the origin of the co-ordinates) the above equations must subsist, but are not sufficient; the forces parallel to z must no longer be neglected, and their resulting forces must pass through the origin or fixed point.

Of the equations (M), (N), the former are called equations of *translation;* because, when they subsist, the body has no tendency to take any motion of translation. The latter three are called equations of rotation; because it is necessary they should take place, to prevent the body from taking a rotatory motion; and all the six must subsist at once, to secure a perfect equilibrium. If the equilibrium does not take place, but there is one resulting force only as R; then if R be resolved into X Y Z, the six equations will subsist, provided the forces $- X - Y - Z$ are added to the rest. The three first equations give, as in the former problems,

$$R = \sqrt{\left\{ X^2 + Y^2 + Z^2, \right.}$$

$$\cos. \alpha = \frac{X}{R}, \cos. \beta = \frac{Y}{R}, \cos. \gamma = \frac{Z}{R};$$

so that nothing remains but to employ the three equations, N, to determine the value of the co-ordinates x, y, z, and then to determine the point of application of R. Let

$$L = (X' y' - Y' x') + \&c.$$
$$M = (Z' x' - X' z) + \&c.$$
$$N = (Y' z' - Z' y') + \&c.$$

X, Y, Z, L, M, N, will be known quantities, and the equations (N) will give,

$$L = X y - Y x; \; M = Z x - X z; \; N = Y z - Z y;$$

by which X, Y, Z are determined, and by multiplying these equations by Z, Y, and X, and adding,

$$L Z + M Y + N X = o;$$

without which equation the three preceding equations cannot subsist together: it therefore expresses the conditions of the data of the problem, necessary for all the forces to be reducible into a single one.

Hence it appears that a system of forces in space cannot be generally maintained in equilibrium by a single force. But when the equation $L Z + M Y + N X$ subsists, then there will be a single resulting force, whose direction and intensity may be found; and its point of application may be anywhere in the straight line whose equations are $X y - Y x = L$, &c. In other cases, there will be two resulting forces, which cannot be combined into one.

If the body is fixed either on a centre or an axis, a force must be introduced into the system, which shall satisfy the three equations (M) in the first case, and (N) in the second. The problem will then be indeterminate; and other conditions may be required, such as that a certain pressure shall be produced on a given point or axis, &c. &c.

The pressure which a fixed point or axis sustains from the action of a system is always equal, and in a contrary direction to the force which must be employed to produce equilibrium in the system, in case it was free. The rules, therefore, for the investigation of the pressure on a point or axis, are the same as those for finding the resulting force of a number of producing forces.

The fixed axis of a system of bodies is often sustained on two points, at its extremities, or elsewhere; and it is sometimes required to determine the pressure on these points. Let E F (*fig.* 10.) be the fixed axis; A, B, the points on which it is supported; R M, the resulting force. Then to determine the pressure on A and B, the force R must be resolved into two others applied to the points A, B, according to the rules given above.

In the case of equilibrium about a fixed axis, every force parallel to the axis may be neglected; but to determine the pressure on certain points of this axis, these forces must be taken into consideration. For instance, suppose it were required to determine the pressure which a force R, (*fig.* 11.) parallel to the axis A B, produced on two fixed points, A, B.

Let $A C = B D = r$, $A B = a$; and suppose at the point A, two forces, M, Q, applied in the directions A M, A Q; and at the point B, the force S directed towards B S, so as to produce equilibrium in the system C A B D, then the efforts exercised on A and B will be determined. If the point A be taken as the origin of the co-ordinates x, y; A B for the axis x; A C that of y; the equations of equilibrium become

$$R - M = o; \; S - Q = o; \; R r - S a = o.$$

From the first it appears that the body or system is solicited in the direction A B, the same as if the force R acted directly in that line; and the other equations give $S = Q = \frac{R r}{a}$. Hence, the force R tends to turn the axis on the points A and B, with an equal action in opposite directions.

On the Motion of Bodies directed to Centres of Force.— To solve these problems, we must refer to the general differencial equations of varied motions. These are $\frac{d^2 x}{d t^2} = \frac{d v}{d t} = F$; $x = \phi(t)$; $v = \frac{d x}{d t}$; $F . d x = v d v$; where x = space, and t = time.

If a body descend from a state of rest towards a centre of force, if the intensity of this force at a given distance be known, and likewise the law of its variation; then the velocity at any point, and the time of descending through any given portion of the space, may be found by a proper application of the above equations. The artifice consists in obtaining an expression for the accelerating force in terms of x, the space described: which expression being multiplied by $d x$, the double of its integral will be the square of the velocity, since $F d x = v d v$. And when the velocity is obtained, it may be substituted in this expression $\frac{d x}{v}$, for v; and the integral of it will be equal to the time employed, since $d t = \frac{d x}{v}$.

Force may become an object of calculation, as the cause of motion, when it is either instantaneous, constant, or variable, according to some given law.

If a force acts on any particle of matter instantaneously, or, if after acting on it a certain time, its action ceases, the motion produced is uniform; and we apprehend that it is of this uniform motion alone that the human intellect can form a very accurate conception. For though no one doubts that we are able to compute, justly and accurately, the effects of forces which produce continued varied motion, yet it is always done by some artifice to assist the imagination, and by resolving this variable motion into a number of elementary partial ones, which are supposed infinite: but being fully aware of the error this artificial method might produce, we endeavour to investigate and assign a limit to this error, which fortunately we are not only able to do, but to correct it entirely, so as to add to our first calculation the advantage of mathematical precision.

Let any person, unacquainted with the fluxional or differential calculus, attempt to solve the easiest of the following problems, and he will be insensibly led to the method of limits. He will first divide the space or the time into ten finite parts, next into one hundred, then one thousand; and finding that the error continually diminishes, he will endeavour to find the law of the series, and to what term it continually approaches as a limit, and which will be the answer to the problem, when, instead of a limited number of finite elements, it is supposed divided into a number of infinitely small ones.

Let C (*fig.* 12) be a centre, toward which bodies are attracted with forces which are inversely proportional to the squares of the distance from C. Let a particle begin to descend from A, by the action of a central force residing in C. It is required to ascertain the velocity acquired at any given point O of its descent.

Let f represent some standard force, as that of gravity, and G be the distance at which C exerts a force equal to f. Let $G C = r$. $A C = a$, $A O = x$.

Then F (the force at O) : f (force at G) :: $C G^2 : C O^2$
$r^2 : (a-x)^2$.

Therefore, $F = \frac{f . r^2}{(a-x)^2}$; but since $F d x = v d v$,

$d x$

$dx \cdot \frac{f \cdot r^2}{(a-x)^2} = v\,dv$; and $\frac{v^2}{2} = \int \cdot \frac{f \cdot r^2}{(a-x)^2} + C = \frac{fr^2}{a-x} + C$; and since when $x = o \cdot v = o$, $C = \frac{fr^2}{a}$, and $v^2 = 2\left(\frac{fr^2}{a-x} - \frac{fr^2}{a}\right) = \frac{2fr^2 x}{a \cdot a - x}$, and $v = \sqrt{\frac{2fr^2}{a}} \times \sqrt{\frac{x}{a-x}}$.

To obtain the time t, we must refer to the general equation $dt = \frac{dx}{v}$, and substitute the value of v, above found, in the expression $\frac{dx}{v} = \frac{dx}{\sqrt{\frac{2fr^2}{a} \cdot \frac{x}{a-x}}} = \sqrt{\left(\frac{a}{2fr^2} \cdot \frac{a-x}{x}\right)} \cdot dx = dt \cdot t = \int \sqrt{\left(\frac{a}{2fr^2} \cdot \frac{a-x}{x}\right)} = \sqrt{\frac{a}{2fr^2}} \cdot \sqrt{\frac{a-x}{x}}$; and multiplying the latter fraction by $a - x = \sqrt{\frac{a}{2fr}} \cdot \frac{a-x}{\sqrt{ax-x^2}}$.

To integrate this fraction, suppose $x = \frac{1}{2}a - z$, the integral is then that of the fraction $\frac{-\frac{1}{2}a - z}{\sqrt{\frac{1}{4}(a^2 - z^2)}} - dx$, which may be divided into $\int \frac{-z\,dx}{\sqrt{\frac{1}{4}(a^2 - z^2)}} = \sqrt{(\frac{1}{4}a^2 - z^2)}$, and $\int \frac{-\frac{1}{2}a\,dz}{\sqrt{\frac{1}{4}(a^2-z^2)}} = \frac{1}{2}a$. arc $\left(\cos. = \frac{2z}{a}\right)$. The constant quantity $C = o$, because when $x = o$, $t = o$, $z = \frac{1}{2}a$; substituting for z its value $\frac{1}{2}a - x$; $t = \sqrt{\frac{a}{2m}} \left\{\sqrt{ax - x^2} + \frac{1}{2}a \times \text{arc}\left(\cos. = \frac{a-2x}{a}\right)\right\}$.

For the method of finding this fluent geometrically, see Atwood's treatise on Rectilinear Motion, p. 66.

Example.—Let a body begin to descend from a state of rest at A (*fig.* 13.) towards C. Let the force be such as, if continued uniform, would cause A to descend one foot in one second, required the velocity when it arrives at $O = \frac{1}{2}$ A C.

F (force at O) : f (force at A = 1) :: A C^2 : C O^2 :: $a^2 : (a-x)^2$

$$F = \frac{a^2}{(a-x)^2}$$

$$F \cdot dx = \frac{a^2}{(a-x)^2} \cdot dx = v\,dv$$

$$\frac{v^2}{2} = \frac{a^2}{a-x} + C; \text{ when } x = o, v = o$$

$$\frac{v^2}{2} = \frac{a^2}{a-x} - a = (\text{when } x = \tfrac{1}{2}a)\ \frac{a^2}{\frac{1}{2}a} - a = a$$

$$v^2 = 2a, \text{ and } v = \sqrt{2a}.$$

Suppose a material particle at A (*fig.* 14.) to be solicited by two forces, one producing motion from A towards B, uniformly accelerated; the other tending to move it towards D, and acting in an inverse ratio of the distance of the particle A from B; required the circumstances of the motion which will take place from the action of these forces.

Let A B $= a$, A N $= s =$ the space described at the end of the time t. Let γ be the accelerating force of repulsion from A towards D, and g the constant force which acts in the contrary direction N B. Let m be the value of the force γ, at any distance B assumed as unity. Then by the nature of the question $\frac{\text{N B}}{1}$, or $\frac{a+s}{1} = \frac{m}{\gamma}$, and $\gamma = \frac{m}{a+s}$. The force f, which acts on the particle at the end of the time t, is the difference of the two forces, or $f = \gamma - g$. Hence $f = \frac{m}{a+s} - g$; $f\,ds = v\,dv$; $ds = v\,dt$: by means of these equations, two out of the four quantities s, t, v, f, may be eliminated.

The first and second equations give $v\,dv = \left(\frac{m}{a+e} - g\right) ds$; and by integration $\frac{v^2}{2} = m.$ hyp. log. $(a+e) - gs + C$; at the point A $v = o$, $s = o$; hence $C = -m$. hyp. log. a.

Therefore $v = \pm \sqrt{\left\{2m \times \text{hyp. log.}\left(\frac{a+s}{a}\right) - 2gs\right\}}$

To obtain the relation between s and t, the value of v thus found, must be substituted in the differential equation $v = \frac{ds}{dt}$, and the integral found as in the former example.

This problem relates to the case of a piston moving in a cylinder, containing in the part A B an elastic fluid. The piston being acted on by the action of gravity, and likewise by the action of the external air, will tend to descend with a constant force g, and the action γ of the elastic fluid will be the less, as the space containing it is greater, or as the piston is farther from B.

To obtain the maximum of velocity, dv must $= o$, or $f = \frac{m}{a+s} - g = o$, and $a + s = \frac{m}{g} =$ B N, beyond which point v decreases, the motion is retarded, and ceases when m. hyp. log. $\left(\frac{a+s}{a}\right) = gs$, when it is again accelerated, and but for the effect of friction the body would thus oscillate for ever.

We are next to investigate a general formula for curvilinear motion, and to consider the method of its application.

When a body describes a curve in consequence of the action of certain forces, we may, in imagination, resolve this curve into an indefinite number of elementary spaces, and suppose each to be the side of an infinitely small polygon, so that the body changes at every instant the direction of its motion, which is always that of the tangent or prolongation of the side of the small polygon. To estimate the velocity at any moment, we may conceive the forces to cease to act in the same manner as in the case of rectilinear motion, and then the velocity v may be represented by $\frac{ds}{dt}$.

Whatever be the forces which act on the body, they may always be resolved into three, which are parallel to three rectangular co-ordinates; it is evident that each of the producing forces will have an effect independent of the two others, and consequently we may apply to each the theorems established for rectilinear motion; it is thus that we learn the nature of the motion, and determine the trajectory which the body describes, when the intensity and direction of the forces are given. Curvilinear motion is thus reduced to two or three rectilinear motions, according as the curve is of the single or double curvature.

When the trajectory lies in the same plane, the motion may be represented by two equations, $x = \phi(t)$; $y = f(t)$: by eliminating t, a relation is obtained between x and y, which will be the equation of the curve described. If the curve be of double curvature, the motion will be represented by three equations, $x = \phi(t)$, $y = f(t)$, $z = \psi(t)$; and by eliminating t, two equations will be obtained in terms of x, y, and z, which will be those of double curvature described by the body. The equations $x = \phi(t)$, $y = f(t)$, $z = \psi(t)$.

Let P′, P″, be constant forces, which act on the material particle M, at the end of the time t. Let α', α''; β', β''; γ', γ''; be the angles formed by their directions with the respective axes of x, y, z. Let each force be resolved into three others parallel to these respective axes, namely, X, Y, Z, then each of these forces will impress on the body an elementary impulsion, each in its own direction. Hence these equations;

$$X = P' \cos. \alpha' + P'' \cos. \alpha'' + \&c.$$
$$Y = P' \cos. \beta' + P'' \cos. \beta'' + \&c.$$
$$Z = P' \cos. \gamma' + P'' \cos. \gamma'' + \&c.$$

At the end of the time t, the point M, in that point of its trajectory which has for its co-ordinates x, y, z, will have in the direction of x a velocity $= \frac{dx}{dt}$, so that in this point we may conceive the body in repose, and receiving in the direction of the axis x an impulsion producing the velocity $\frac{dx}{dt}$; this velocity should increase during the time dt, by a quantity $= d\left(\frac{dx}{dt}\right)$, by the effect of the constant forces P, P″, &c. so as to become $= \frac{dx}{dt} + d\left(\frac{dx}{dt}\right)$. But, as we have already seen, the velocity communicated in the direction of the axis x is equal $\frac{dx}{dt} + X\,dt$; and as the effects of the other rectangular forces are independent, the forces X, Z, do not change this. Hence the velocities $X\,dt$, $d\left(\frac{dx}{dt}\right)$ are equal. Reasoning in the same manner as to the other forces, we have the following equations.

$$\left.\begin{aligned} X\,dt &= d\left(\frac{du}{dt}\right) \\ Y\,dt &= d\left(\frac{dy}{dt}\right) \\ Z\,dt &= d\left(\frac{dz}{dt}\right) \end{aligned}\right\}(A')$$

Or taking dt constant,

$$\left.\begin{aligned} X &= \frac{d^2x}{dt} \\ Y &= \frac{d^2y}{dt} \\ Z &= \frac{d^2z}{dt} \end{aligned}\right\}(B')$$

which are the general formulæ of motion for a body moving in free space.

These equations are sufficient to investigate all the circumstances of the motion of a material point, that is, to assign its velocity and situation in its trajectory at any given instant. Suppose the forces to act in some plane, *viz.* that of x and y, X and Y being given either constant or variable, we have then only to eliminate t, the time from the two equations $X = \frac{d^2x}{dt^2}$, $Y = \frac{d^2y}{dt^2}$. This being effected, and the integrations made, an equation is obtained between x and y; similar relations may be obtained between x and t, and y and t, then $\frac{dx}{dt}$, $\frac{dy}{dt}$ will give the velocities in the directions of the axes of x and y; whence the real velocity may be concluded, which will be $v = \frac{ds}{dt} = \sqrt{\left\{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2\right\}}$.

A formula, more useful on many occasions, may be thus obtained.

In the equations

$$X = \frac{d^2x}{dt^2}; \quad Y = \frac{d^2y}{dt^2}; \quad Z = \frac{d^2z}{dt^2}$$

Multiply by dx, dy, dz, as follows:

$$X\,dx + Y\,dy + Z\,dz = \frac{dx\,d^2x + dy\,d^2y + dz\,d^2z}{dt^2};$$

but the numerator of the second member of this equation is the differential of $\frac{1}{2}(dx^2 + dy^2 + dz^2)$, or of $\frac{1}{2}ds^2$; therefore, by taking the integrals, we have $\frac{ds^2}{dt^2} = v^2 = C + 2\int(X\,dx + Y\,dy + Z\,dz)$. This equation, which is similar to that we have already used in the case of rectilinear motion, cannot give an exact solution, except $X\,dx + Y\,dy + Z\,dz$ be an exact differential; or, to use the language of fluxions, except its exact fluent can be found.

If, therefore, X, Y, Z, be functions of x, y, z, the following conditions should subsist,

$$\frac{dX}{dy} = \frac{dY}{dx}, \quad \frac{dX}{dz} = \frac{dZ}{dx}, \quad \frac{dY}{dz} = \frac{dZ}{dy}, \text{ and}$$

$v^2 = 2\phi + C$.

The constant quantity C depends on the initial velocity, or on the velocity at some given instant. This last equation comprehends the principle of the "conservatio virium vivarum."

This proposition is in fact the same as the 39th prop. of the first book of Newton's Principia. The reader will find a very ample geometrical demonstration, accompanied with many valuable remarks on these theorems, in Dr. Robinson's Mechanical Philosophy, and in the Supplement to the Encyclop. Britan.

One of the most simple examples of the application of these

these equations, is the motion of a projectile in an unresisting medium. Let the velocity of the material point M (*fig.* 15.) $= V$ in the direction of the angle θ, with the axis of x; let it be proposed to determine the curve it describes. Let the axis of y be vertical, as there is no other force but that of gravity: $X = o$; $Z = o$; $Y = -g$; therefore $\frac{d^2 x}{dt^2} = o$, $\frac{d^2 z}{dt^2} = o$, $\frac{d^2 y}{dt^2} = -g$; and by integration

$$\frac{dx}{dt} = c; \frac{dz}{dt} = c''; \frac{dy}{dt} = c' - gt.$$

The first of these equations, divided by the second, gives by integration

$$c'' x = c z$$

equation to a straight line, which shews that the projection of the trajectory upon the horizontal plane of xy is a straight line, and that the curve is in a vertical plane, passing through the axis of y.

The equations $\frac{dx}{dt} = c$, $\frac{dy}{dt} = c' - gt$, by integration give $x = ct$; $y = c't - \frac{1}{2}gt^2$.

No constant quantities need be added since when $t = o$, $x = o$, $y = o$. To determine the other two constant quantities, c and c', at the commencement of motion, since $\frac{dx}{dt}$, $\frac{dy}{dt}$, are the velocities at every instant, if the velocity V is vertical, when $t = o$, $\frac{dx}{dt} = o$, and $\frac{dy}{dt} = V$, hence $c = o$, $c' = V$. But when the force producing the velocity V is in the direction of the angle θ, with the axis of x, then when $t = o$, $c = V$, cos. θ and $c' = V$ sin. θ.

Of the expressions for x and y, one is the equation of uniform motion, the other of uniformly varied motion; eliminating t from these equations, we find $y = \frac{c'}{c} x - \frac{g x^2}{2 c^2}$; substituting for c and c' their trigonometrical values, the equation to the trajectory

$$y = x \,.\, \text{tang. } \theta - \frac{g x^2}{2 V^2 \,.\, \cos.^2 \theta}.$$

For V substitute its value $2gh$, (h being the height due to the velocity V,) and

$$y = x \,.\, \text{tang. } \theta - \frac{x^2}{4h \,.\, \cos.^2 \theta}$$

equation to a parabola.

In the solution of these problems we are to observe, that when the nature of the curve is required, it is to be found by determining the relation between x and y, and by combining the differential equations with some value of v or t, given by the nature of the problem. On the other hand, when the curve is known, from a given relation between x and y, then the values of v and t are to be determined, by combining the same general differential equations with the element of the curve, which represents the element of the space, and which is known in terms of x or y by the equation to the curve.

If, in the above problem, the projectile be supposed to move in a medium, the law of whose resistance is known, the investigation of the curve becomes much more difficult. The expressions for the forces X, Y, Z, will no longer be of the simple form, as in our example; the term t will be more difficult to eliminate, and the subsequent integrations infinitely more complex: but the general principle will remain precisely the same. See PROJECTILE.

The same principles apply to the motion of bodies in trajectories; the particular cases of this application will be given under TRAJECTORY, the general nature of the method being as follows.

General theory of the trajectories described by bodies acted on by centripetal forces.—Suppose a material particle projected in any direction, and continually drawn towards a given point by a force varying as some function of the distance, and whose intensity is likewise known at some given distance: from these data we are to investigate the principle by which the curve may be determined.

Let three rectangular co-ordinates be drawn through the centre of force; and let P represent the absolute intensity of the force at a given instant; the radius vector drawn from the centre of force to the point M, in which the body is at that instant, makes with each axis a certain angle; the cosines of these angles are $\frac{x}{r}$, $\frac{y}{r}$, $\frac{z}{r}$; the forces, therefore, that result from the resolution of the force P, and which are equivalent to it, are $\frac{Px}{r}$, $\frac{Py}{r}$, $\frac{Pz}{r}$.

If, therefore, the element dt be supposed constant, then, by the preceding formulæ, (since the forces tend to diminish the co-ordinates,)

$$\frac{d^2 x}{dt^2} = -\frac{Px}{r}; \quad \frac{d^2 y}{dt^2} = -\frac{Py}{r}; \quad \frac{d^2 y}{dt^2} = -\frac{Pz}{r} \quad (1)$$

To integrate these equations, multiply the first by y, the second by x, and subtract the first product from the second; then

$$\frac{x d^2 y - y d^2 x}{dt^2} = o;$$

and
$$x dy - y dx = c dt$$
$$z dx - x dz = c' dt$$
$$y dz - z dy = c'' dt.$$

Multiply these equations by x, y, z, respectively, and add, then $c'' x + c' y + c = o$, which equation belongs to the trajectory, and indicates that this curve is a plane passing through the centre of force. Therefore, in the solution of the problem, we may consider only the two axes of x and y. Let F D M (*fig.* 16.) be the curve; M the point in which the moving body is found at the end of the time t; A the centre of the forces $AP = x$, $PM = y$, $AM = r$. The angle $MAx = u$, the right-angled triangle for the transformation of its ordinates into polar co-ordinates, (see *Analytic* GEOMETRY,) gives

$$\left.\begin{array}{r} r^2 = x^2 + y^2;\ x = r \cos. u;\ y = r \sin. u \\ dx = -r \sin. u\, du + \cos. u\, dr \\ dy = r \cos. u\, du + \sin. u\, dr \end{array}\right\}$$

See also *Analytic* FUNCTION, where these differential equations are explained.

Therefore, $x dy - y dx = r^2 du$;
and $r^2 du = c dt$.

But $\int . r^2 . du$, or $\int . (x dy - y dx)$ is the double of the area MAH contained by the two radii vectores MA, AH, the position of one of which is fixed: therefore, this area $= \frac{1}{2} ct + A$, taking the radius A H as fixed and belonging to M, when $t = o$.

Hence it appears, that whatever be the central force, the area described will always be proportional to the time.

By equation (1) $\frac{d^2x}{dt^2} = -\frac{Px}{r}$,

$$\frac{d^2y}{dt^2} = -\frac{Py}{r}$$

multiply by dx, dy respectively, and add: and then since $x\,dx + y\,dy = r\,dr$

$$\frac{dx\,d^2x + dy\,d^2y}{dt^2} = -P\,dr.$$

But as the intensity of the force P is supposed to vary by hypothesis, as some function of the distance r, the integral of $P\,dr$ may be found.

Suppose $\int.(P\,dr) = \phi + C$, then

$$\frac{dx^2 + dy^2}{dt^2} = -2(\phi + C) = v^2.$$

This equation contains the principle of the vis viva; it is in substance the same as the 40th Prop. Sect. VIII. of Newton's Principia, from which it is inferred, that if two bodies have at any one distance the same velocity, when acted on by any centripetal force, they shall always have the same velocity at any other equal distances.

By the transformation of the co-ordinates we obtain these equations,

$$r^2du = c\,dt,\quad dr^2 + r^2du^2 = -2(\phi + C)\,dt^2,$$

and by eliminating dt, the differential equation of the trajectory becomes

$$du = \frac{c\,dr}{r\sqrt{\left\{-r^2(\phi + C) - c^2\right\}}},$$

the integration of which quantity gives the curve required; but this can only be effected in particular cases.

This is the celebrated inverse problem of centripetal forces, and is the 42d Prop. of the 1st Book of Newton's Principia. A geometrical solution, with many illustrations, is given by Dr. Robison, in the article *Dynamics*, Sup. Encyclop. Britan.

Of Forces which act on a body constrained to move on a given surface.—Let a material particle descend from the point B, (*fig.* 17.) and describe the curvilinear space B M, arriving at M at the end of the time t: let Ax be the horizontal, Ay the vertical axis; so that A P $= x$, P M $= y$, B M $= s$: let B C $= k$. The velocity v, in the direction of the element of the curve, is $v = \frac{ds}{dt}$, and the augmentation by the force of gravity is dv in the time dt; but this force tends to communicate the velocity $g\,dt$ in the element of time dt, in the direction M G; let this velocity be decomposed into two, one in the direction of the normal, and which is evidently destroyed by the resistance of the curve; and the other in the direction of the tangent M H $= g\,dt\,.\,\frac{dy}{ds}$, since $\frac{dy}{ds}$ is the cosine of the angle formed by the tangent T M with the axis of y. Therefore the augmentation of velocity is $dv = g\,dt\,.\,\frac{dy}{ds}$; hence $v\,dv = g\,dy$, and by integration $v^2 = 2g\,(y + C)$. Now at the point B, $y = k$, where the velocity is either zero, or such as is due to some given height h, according as the particle had or had not some initial velocity; therefore, either $v = o$ or $v^2 = 2gh$, when $y = k$; hence $C = -k$ or $h - k$. Therefore $v^2 = 2g\,(y - k)$, or $v^2 = 2g\,(y + h - k.)$

In the first case $v^2 = 2g \times$ MI; therefore, a gravitating particle has the same velocity in the direction of the tangent at any part of the curve, as if it had fallen freely from the same height, and that whatever be the nature of the curve.

From the above equations we obtain

$v = \sqrt{\left\{2g\,(y - k)\right\}}$ and $\frac{ds}{dt} = \sqrt{\left\{2g(y-k)\right.}$, and

$$dt = \frac{ds}{\sqrt{\left\{2g\,(y - k)\right.}}.$$

From the equation of the curve ds will be known in terms of y and dy, and t will then be obtained by integration.

The case of the simple pendulum may be taken as an easy example of the application of this method; a more complete investigation will be reserved for its proper place under the article PENDULUM.

General theory of the Pendulum.—The equations are $\frac{d^2s}{dt^2} = \frac{dv}{dt} = \phi$; ϕ being the constant force estimated in the direction of the tangent of the curve; s the arc described at the end of the time t; and $v = \frac{ds}{dt} =$ the velocity acquired. Let g be the force of gravity acting on the material point M, suspended at the extremity of the line C M, supposed without weight and inflexible, C the point of suspension, A P $= x$ the vertical abscissa, P M $= y$ the ordinate of the centre of oscillation, A C $= a$ the length of the pendulum, A D $= b$ the versed sine of the arc B A B′ (*fig.* 18.); B the point of departure, s the arc A M, and v the velocity acquired in the point M at the end of the time t.

The velocity v, due to the height D P $= b - x$, is

$$v = \frac{ds}{dt} = \sqrt{2g\,(b - x)};$$

but the arc decreasing as the time t increases,

$$dt = \frac{-ds}{\sqrt{2g\,(b - x)}};$$

but ds must be expressed in terms of dx, in order to effect the necessary integration. The square of the element of the arc being expressed by $ds^2 = dx^2 + dy^2$,

$$ds = dx\sqrt{1 + \left(\frac{dy}{dx}\right)^2};$$

the equation to the circle being

$$x^2 + y^2 - 2ax = o,$$

$$\text{and } ds = \frac{a\,dx}{y} = \frac{a\,dx}{\sqrt{2ax - x^2}},$$

we obtain $dt = \frac{-a\,dx}{\sqrt{2g\,(bx - x^2)\,(2a - x)}}$.

The determination of the time therefore depends on the integration of the above expression, which we shall not enter into at present. This integration effected, gives

$$t = \tfrac{1}{2}\sqrt{\left(\frac{a}{g}\right)}\,.\left\{1 + \left(\tfrac{1}{2}\right)^2\frac{b}{2a} + \left(\frac{1\,.\,3}{2\,.\,4}\right)^2\frac{b^2}{2^2a^2} + \left(\frac{1\,.\,3\,.\,5}{2\,.\,4\,.\,6}\right)^2\frac{b^3}{2^3a^3} + \&c.\right\}\ \text{arc}\left(\cos. = \frac{2x - b}{b}\right).$$

At the limit $x = b$, likewise $t = o$, and when $x = o$ arc $\left(\cos. = \frac{2x - b}{b}\right) = \pi$ or 3π, 5π, &c.; π being the semi-circumference whose rad. $= 1$. Substituting T for the value of t resulting from the definite integral,

T =

$T = \frac{1}{2} \sqrt{\left(\frac{a}{g}\right)} \cdot \left\{ 1 + \left(\frac{1}{2}\right)^2 \frac{b}{2a} + \left(\frac{1 \cdot 3}{2 \cdot 4}\right)^2 \frac{b^2}{2^2 a^2} \right.$ $\left. \left(\frac{1 \cdot 3 \cdot 5}{2 \cdot 4 \cdot 6}\right)^2 \frac{b^3}{2^3 a^3} + \&c. \right\} \pi.$

When b or the arc of oscillation is very small, b may be neglected, and the whole oscillation $2\,T$ becomes $2\,T = \pi \sqrt{\frac{a}{g}}$. See PENDULUM; and for the curve of quickest descent, see CYCLOID and *Analytic* FUNCTION. For the motion on an inclined plane, which is a more simple case of the same kind; see INCLINED *Plane*.

In the above examples the motion has been supposed to arise from the action of gravity alone, but the theory may be generalized and extended to any forces whatever.

A body cannot be constrained to move in a curve surface without exerting a re-action on the curve, which will always be perpendicular to the surface. Instead of this re action, let us suppose a normal force N, whose intensity and direction will continually vary, but will always be equal and opposite to the pressure; let this force be included with the others, and with them finally reduced to two, X and Y; the moving particle or body will then be in the same state as if free, and will describe a trajectory suited to the action of these forces. Let B M Z (*fig.* 19.) be the curve; X, Y, the forces parallel to the axes A x, A y; M the place of the body at the end of the time t; B M $= s$, A P $= x$, P M $= y$, and N equal to the normal force expressing the re-action of the curve: $\frac{dy}{ds}$, $\frac{dx}{ds}$, are the cosines of the angles which the normal makes with the axes x and y, therefore the producing forces equivalent to N in the direction of these axes are $-\,N\frac{dy}{ds}$, and $N\frac{dx}{ds}$; the first is negative, because it tends to diminish the value of x. The body may therefore be considered as free and solicited by the forces $X - N\frac{dy}{ds}$, and $Y + N\frac{dx}{ds}$, and the equations of varied motion already given become

$$\left.\begin{array}{l} \frac{d^2x}{dt^2} = X - N\frac{dy}{ds}\,;\ \frac{d^2y}{dt^2} = Y + N\frac{dx}{ds} \\ d\left(\frac{dx}{dt}\right) = \left(X - N\frac{dy}{ds}\right)dt\,;\ d\left(\frac{dy}{dt}\right) = \left(Y + N\frac{dx}{ds}\right)dt \end{array}\right\} (m)$$

By combining with these the equation of the curve, three relations are obtained between the four variable quantities x, y, t, and N, so that by integration and elimination equations are obtained between any two of them.

To find the velocity, multiply the first of the above equations by dx, and the second by dy, and add them, the terms containing N will then disappear, and an equation, similar to those already found, will be obtained, *viz.*

$$v^2 = C + 2\int (X\,dx + Y\,dy) \text{ or}$$
$$v^2 = C + 2\,\phi,$$

which contains the principle of the *vis viva* as was observed above. See MECHANICS.

The value of C depends on the values of v and ϕ at some given instant; let v' and ϕ' be these values at that instant, then making $v = v'$, and $\phi = \phi'$, $A = v'^2 - 2\,\phi'$, and v at the second point is given since $v^2 = v'^2 + 2(\phi - \phi')$, now the value of ϕ and ϕ' depend on the co-ordinates of the extreme points, so that the velocity at the second instant is given by the velocity at the first, and by the position of these points; we may hence infer, that the velocity does not depend on the form of the curve described, but only on the respective positions of the point of departure, and of the point at which the body arrives; so that had the body been constrained to move in any other curve passing through these points, the velocity acquired at the second point will be the same. It appears likewise from this, that the pressure against a curve surface does not diminish or change the velocity.

If the body is not solicited by the continual action of any force, but arises only from some primitive impulsion, its velocity will be constant, for when $X = o$, $Y = o$, $C = v^2$.

The case of gravity is included in this result; for if $X = o$, $Y = g$, and $v^2 = C + 2gy$, for if B be the point of departure from a state of rest, (*fig.* 20.) then making $Y = B\,C = k$ as before, $v = o$ and $C = -\,2gk$ and $v^2 = 2g(y - k) = 2g \times$ M I. The same as found above.

The pressure which the body exerts on the curve is equal and opposite to the force N; to determine it let dt be taken as constant, and dx as variable, then the preceding equations (m) become

$$-\frac{dx}{dt}\cdot d^2t = X - N\cdot\frac{dy}{ds}$$
$$\frac{dt\,.\,d^2y - dy\,.\,d^2t}{dt^3} = Y + N\frac{dx}{ds}.$$

To exterminate d^2t, multiply the first by dy, the second by dx, and subtract, then since $ds^2 = dx^2 + dy^2$ $\frac{dx\,d^2y}{dt^2} = Y\,dx - X\,dy + N\left(\frac{dz^2 + dy^2}{ds}\right) = Y\,dx - X\,dy + N\,ds$. The value of N might be determined in terms of X and Y, and of the differentials depending on the nature of the curve, but the formula may be rendered more simple, by introducing the radius of curvature R, which is always equal to $\frac{ds^3}{dx\,d^2y}$. By substituting therefore for $dx\,d^2y$ its value $\frac{ds^3}{R}$, we obtain this equation;

$$N = \frac{v^2}{R} + \frac{X\,dy - Y\,dx}{ds}\ (n)$$

When, therefore, a material point is constrained to move on a curve surface, whose equation $y = \phi\,x$ is given, we must to the general equation

$$\frac{ds^2}{dt^2} = v^2 = C + 2\int(X\,dx + Y\,dy + Z\,dz)$$

and for X, Y, y and dy, substitute their values in terms of x; and deduce the value of v; with which quantity, by a similar substitution in the preceding formula (n), we shall obtain by integration the velocity in the direction of every axis at the end of a given time t.

It appears by equation (n), that the pressure $-$ N, which the body exerts against the curve it describes, is composed of two parts; one entirely depending on the velocity of the body, the other on the accelerating forces by which it is solicited; the other is the sum of the forces $-\,X\frac{dy}{ds}$, $Y\frac{dx}{ds}$, which combined, produce the accelerating forces in the direction of the normal. If the body is not subject to the action of any accelerating force, its motion can only arise from an original impulsion, and will therefore be uniform; the pressure therefore will be expressed by the first part

part of the equation, and if h expreſs the height due to the velocity v,

$$N = \frac{v^2}{R} = \frac{2gh}{R}$$

N then becomes what is called the centrifugal force; it is that part of the preſſure which ariſes from the velocity alone: in general this force varies at every inſtant, but becomes conſtant when the body deſcribes the circumference of a circle, ſince v and R are in that caſe conſtant.

On the motion of a point reſtrained to move on a curve ſurface. Let the differential equation to the ſurface be

$$dz = p\,dx + q\,dy,$$

p and q being the coefficients of the partial differences of z taken reſpectively relative to x and y, (ſee *Analytic* FUNCTION.)

(Let $M = \sqrt{1 + p^2 + q^2}$). Now the angles which the normal to a curve ſurface makes with the axes of x, y, and z, are $\frac{p}{M}$, $\frac{q}{M}$, $\frac{1}{M}$, (ſee *Analytic* GEOMETRY.) Conceive a force N to be added in the direction of the normal, equal and contrary to the preſſure, its producing forces in the direction of the axes will be $-\frac{pN}{M} - \frac{qN}{M}$ and $\frac{N}{M}$; the two firſt terms are negative, becauſe they tend to diminiſh the co-ordinates x and y, ſuppoſing the convexity of the ſurface to be towards the planes xz, and yz; the point may now be conſidered as free, and ſolicited by the three accelerating forces $X - \frac{Np}{M}$, $Y - \frac{Nq}{M}$, and $Z + \frac{N}{M}$. Inſtead of the former equations (A') (B') of curvilinear motion, we have (ſuppoſing dt conſtant,)

$$\frac{d^2x}{dt^2} = X - \frac{Np}{M}$$

$$\frac{d^2y}{dt^2} = Y - \frac{Nq}{M}$$

$$\frac{d^2z}{dt^2} = Z + \frac{N}{M}.$$

Of the meaſure of Force.—Early in the laſt century a controverſy was carried on relative to this ſubject, with a keenneſs which was not perfectly conſiſtent with the dignity of true philoſophy. Now that all difference of opinion has nearly or entirely ceaſed, we are enabled to take an impartial review of the ſubject, and it appears that the queſtion turned much on a diſpute about the meaning of words, each party admitting all the facts produced by the other, and each party ſolving all problems relating to the ſubject by the ſame means, and obtaining the ſame reſult. Newton had defined the meaſure of force to be the maſs of a body multiplied into its velocity, and for the purpoſes of thoſe philoſophical inveſtigations in which Newton was engaged, this definition was both convenient, and at the ſame time mathematically juſt; but there is another point of view, in which it appears that the effects of force may, without any impropriety, be ſaid to depend on the maſs multiplied into the ſquare of the velocity; it is this product which has been called the *vis viva*, and which has been ſo repeatedly mentioned in the preceding pages. Bernouilli and Leibnitz conſidered the *vis viva* as the true and univerſal meaſure of force, in oppoſition to the Newtonian definition. It is now generally admitted that theſe great mathematicians were led into a miſtake, by not ſufficiently taking into conſideration all the circumſtances of the queſtion of diſpute. But it muſt be admitted that the meaſure adopted by them, and called the *vis viva*, merits attention, and in all caſes of practical machinery it is often the moſt accurate, and always the moſt uſeful; and does not imply the leaſt contradiction to the Newtonian definition, only the force thus meaſured ſhould be diſtinguiſhed by ſome peculiar name, as for example the *vis mechanica*, the Newtonian meaſure being applied to the *vis motrix*, as ſuggeſted by Mr. Wollaſton in the Bakerian Lecture for the year (1805), from which the following is an extract.

Let a ball of clay, or any other ſoft and wholly inelaſtic ſubſtance, be ſuſpended at reſt, but free to move in any direction with the ſlighteſt impulſe; and let there be two pegs, ſimilar and equal in every reſpect, be inſerted into its two oppoſite ſides; let there be alſo two other bodies, A and B, of any magnitude, which are to each other in the proportion of two to one, ſuſpended in ſuch a poſition, that when perfectly at reſt, they ſhall be in contact with the extremities of the oppoſite pegs, without preſſing on them. Now if theſe bodies were made to ſwing, with motions ſo adapted, that in falling from heights in the proportion of one to four they might ſtrike at the ſame inſtant againſt the pegs oppoſite to them, the ball of clay would not be moved from its place to either ſide; nevertheleſs the peg impelled by the ſmaller body B, which has the double velocity, will be found to have penetrated twice as far as the peg impelled by A.

It is unneceſſary to make the experiment preciſely as here ſtated, ſince the reſults are admitted as facts by both parties, but upon theſe facts they reaſon differently.

One ſide, obſerving that the ball of clay remains unmoved, conſiders the proof indiſputable, that the action of the body A is equal to that of B, and that their forces are properly meaſured by their moments, which are equal, becauſe their velocities are in the ſimple inverſe ratio of the bodies. Their opponents think it equally proved, by the unequal depths to which the pegs have penetrated, that the cauſes of theſe effects are unequal, as they find to be the caſe in their eſtimation of the forces by the ſquares of the velocities.

One party is ſatisfied, that equal *momenta* can reſiſt equal preſſures during the ſame *time*; the other party attend to the ſpaces through which the ſame moving force is exerted, and finding them in the proportion of two to one, are convinced that the *vis viva* of a body in motion is juſtly eſtimated by its magnitude, and the ſquare of its velocity jointly.

The former conception of a quantity dependent on the continuance of a given *vis motrix* for a certain *time*, may have its uſe, when correctly applied, in certain philoſophical conſiderations; but the latter idea of a quantity reſulting from the ſame force, exerted through a determinate *ſpace*, is of greater practical utility, as it occurs daily in the uſual occupations of men; ſince any quantity of work performed is always appreciated by the extent of effect reſulting from their exertion; for it is well known, that the raiſing any great weight forty feet would require four times as much labour, as would be requiſite to raiſe an equal weight to the height of ten feet; and that in its ſlow deſcent, the former would produce four times the effect of the latter, in continuing the motion of any kind of machine. Moreover, if the weights ſo raiſed were ſuffered to fall freely through the heights that have been aſcended, by means of four and of one minutes' labour, the velocities acquired would be in the ratio of two to one; and the ſquares of the velocities in proportion to the quantities of labour from which they originated, as four to one; and if the forces acquired by their deſcent were employed in driving piles, their more ſudden effects produced would be found to be in that ſame ratio.

This

This ſpecies of force has been, firſt by Bernouilli, and afterwards by Smeaton, very aptly denominated mechanic force; and when by force of percuſſion is meant the quantity of mechanic force poſſeſſed by a body in motion to be eſtimated by its quantity of mechanic effect, I apprehend that it cannot be controverted, that it is in proportion to the magnitude of the body, and to the ſquare of its velocity jointly.

But of this quantity of force Newton no where treats, and has accordingly given no definition of it. If, after defining what he meant by the *quantitas acceleratrix*, and *quantitas motrix*, he had had occaſion to convey an equally diſtinct idea of the *quantitas mechanica*, reſulting from the continued action of any force, he might not improbably have proceeded conformably to the definition given by Smeaton, and have added, "quantitas mechanica eſt menſura proportionalis ſpatio per quod data vis motrix exercetur;" or, if ſpeaking with reference to the accumulated energy communicated to a body in motion, "proportionalis quadrato velocitatis quam in dato corpore generat."

But if we attend to the firſt words of his preface to the firſt edition of his "Principia," he evidently had no need of ſuch a definition; "Nos autem non artibus ſed philoſophicæ conſulentes, deque potentiis non in manualibus ſed naturalibus ſcribentes," &c. and again nearly to the ſame effect in the ſcholium which follows the laws of motion; "Cæterum mechanicam tractare non eſt hujus inſtituti."

Dr. Wollaſton proceeds to obſerve, that if it be of any real utility to give the name of force to this complicated idea of *vis motrix* extended through time, as well as that of momentum to its effects when unreſiſted, it would be requiſite to diſtinguiſh this force always by ſome ſuch appellation as *momental* force; for it is to be apprehended, that for want of this diſtinction, many writers themſelves, and it is certain, that many readers of diſquiſitions on this ſubject, have confounded and compared together *vis motrix*, *momentum*, and *vis mechanica*; quantities, that are all of them totally diſſimilar, and bear no more compariſon to each other than lines to ſurfaces, or ſurfaces to ſolids.

In practical mechanics, however, it is, at leaſt very rarely, that the momentum of bodies is in any degree an object of conſideration; the ſtrength of machinery being in every caſe to be adapted to the *quantitas motrix*, and the extent and value of the effect to be produced depending on the *quantitas mechanica* of the force applied, or in other words to the ſpace through which a given *vis motrix* is exerted.

The comparative velocities given by different quantities of mechanic force to bodies of equal or unequal magnitude, have been ſo diſtinctly treated of by Smeaton, (Phil. Tranſ. vol. 66. p. 450.) in a ſeries of moſt direct experiments, that it would be a needleſs waſte of time to re-conſider them in this place. So alſo, on the contrary, the quantities of extended mechanic effect, producible by bodies moving with different quantities of impetus, have been as clearly traced by the ſame accurate experimentaliſt; (vol. 72. p. 337.)

But there is one view in which the comparative forces of impact of different bodies were not examined by Smeaton, and it may be worth while to ſhew that when the whole energy of a body A is employed without loſs in giving velocity to a ſecond body B, the impetus which B receives is, in all caſes, equal to that of A, and the force transferred to B, or by it to any third body C, (if alſo communicated without loſs, and duly eſtimated as a mechanic force,) is always equal to that from which it originated.

As the ſimpleſt caſe of entire transfer, the body A may be ſuppoſed to act upon B in a direct line, through the medium of a light ſpring, ſo contrived, that the ſpring is prevented by a ratchet from returning in the direction towards A, but expands again entirely in the direction towards B, and by that means exerts the whole force which had been wound up by the action of A in giving motion to B alone. In this caſe, ſince the moving force of the ſpring is the ſame upon each of the bodies, the accelerating force acting upon B at each point, is to the retarding force oppoſed to A at the correſponding points, in the reciprocal ratio of the bodies; and the ſquares of the velocities produced and deſtroyed by its action through a given ſpace will conſequently be in that ſame ratio. The momentum, which is in the ſimple reciprocal ratio of the bodies, might conſequently be increaſed at pleaſure by the means propoſed, in the ſubduplicate ratio of the bodies employed; and if momentum were an efficient force, capable of reproducing itſelf, and of overcoming friction in proportion to its eſtimated magnitude, the additional force acquired by ſuch a means of increaſe might be employed in counteracting the uſual reſiſtances, and perpetual motion would be effected. But ſince the impetus remains unaltered, it is evident that the utmoſt which the body B could effect in return, would be the reproduction of A's velocity, and reſtitution of its entire mechanic force, neither increaſed nor diminiſhed, excepting by the neceſſary imperfection of machinery. The poſſibility of perpetual motion is, conſequently, inconſiſtent with thoſe principles which meaſure the quantity of force by the quantity of its extended effect, or by the ſquare of the velocity which it can produce.

In eſtimating the utmoſt effect which one body can produce upon another at reſt, the ſame reſult is obtained by employing impetus as aſcenſional force, according to Huygens; for if the body A were allowed to aſcend to the height due to its velocity, and if, by any ſimple mechanical contrivance of a lever or otherwiſe, the body B were to be raiſed by the aſcent of A, it is well known that the heights of aſcent would be reciprocally as the bodies; and conſequently, that the *ſquare* of the velocity to be acquired by free deſcent of B would be in that ratio, and the quantity of mechanic force would be preſerved, as before, unaltered.

It may be of uſe alſo to conſider another application of the ſame energy, and to ſhew more generally that the ſame quantity of total effect would be the conſequence, not only of direct action of bodies upon each other, but alſo of their indirect action through the medium of any mechanical advantage or diſadvantage, although the time of action might by that means be increaſed or decreaſed in any deſired proportion. For inſtance, if the body ſuppoſed to be in motion were to act, by means of a lever, upon a ſpring placed at a certain diſtance from the centre of motion, the retarding force oppoſed to it would be inverſely as the diſtance of the body from the centre; and ſince the ſpace through which the body would move to loſe its whole velocity would be reciprocally as the retarding force, the angular motion of the lever and ſpace through which the ſpring muſt bend would be the ſame at whatever point of the lever the body acted. And converſely, the re-action of the ſpring upon any other body B would, in all poſitions, communicate to it the ſame velocity.

It may be remarked, however, that the times in which theſe total effects are produced may be varied at pleaſure, in proportion to the diſtances at which the bodies are placed from the centre of motion; and it ſhould not paſs unobſerved, that although the intenſity of any *vis motrix* is increaſed by being placed at what is called a mechanical advantage; yet, on the contrary, any quantity of mechanic force is not liable

to increaſe or diminution by any ſuch variation in the mode of its application.

Since we can, by means of any mechanic force, conſiſting of a *vis motrix* exerted through a given *ſpace*, give motion to a body for the purpoſe of employing its *impetus* for the production of any ſudden effect, or can, on the contrary, occaſion a moving body to aſcend, and thus reſolve its impetus into a moving force, ready to exert itſelf through a determinate ſpace of deſcent, and capable of producing preciſely the ſame quantity of mechanic effect as before, the force depending on impetus may juſtly be ſaid to be of the ſame kind as any other mechanic force, and they may be ſtrictly compared as to quantity. In this manner we may even compare the force of bodies in motion to the ſame kind of force contained in a given quantity of gun-powder, and may ſay, that we have the ſame quantity of mechanic force at command, whether we have one pound of powder, which by its expanſion could give one ton weight a velocity ſufficient to raiſe it through forty feet, or the weight actually raiſed to that height, and ready to be let down gradually, or the ſame weight, poſſeſſing its original velocity, to be employed in any ſudden exertion.

By making uſe of the ſame meaſure as in the former caſes, a diſtinct expreſſion is likewiſe obtained for the quantity of mechanic force given to a ſteam-engine by any quantity of coals; and we are enabled to make a compariſon of its effect, with the quantity of work that one or more horſes may have performed in a day, each being expreſſed by the ſpace through which a given moving force is exerted. In the caſe of animal exertion, however, conſiderable uncertainty always prevails, in conſequence of the unequal powers of animals of the ſame ſpecies, and varying vigour of the ſame animal. The information which the author of this paper has received, in reply to inquiries reſpecting the weights raiſed in one hour by horſes in different ſituations, has varied as far as from ſix to fifteen tons to the height of one hundred feet. But although the height at which mechanic force is generated may vary, any quantity of work executed is the ſame, in whatever time it may have been performed.

In ſhort, whether we are conſidering the ſources of extended exertion or of accumulated energy, whether we compare the accumulated forces themſelves by their gradual, or by their ſudden efforts, the idea of mechanic force in practice is always the ſame, and is proportional to the *ſpace* through which the moving force is exerted or overcome, or to the *ſquare* of the velocity of a body in which ſuch force is accumulated.

Comparative table of mechanical forces, extracted from Dr. Young's lectures.—In order to compare the different eſtimates of the force of moving powers, it will be convenient to take a unit, which may be conſidered as the mean effect of the labour of an active man, working to the greateſt poſſible advantage, and without impediment. This will be found, on a moderate eſtimation, ſufficient to raiſe 10 pounds 10 feet in a ſecond, for 10 hours in a day; or to raiſe an 100 pounds, which is the weight of 12 wine gallons of water, 1 foot in a ſecond, or 36,000 feet in a day; or 3,600,000 pounds, or 432,000 gallons, 1 foot in a day. This we may call a force of 1 continued 36,000″.

Immediate force of men, without deduction for friction.

	Force.	Continuation.	Day's Work.
A man, weighing 133 pounds Fr. aſcended 62 feet Fr. by ſteps in 34″, but was completely exhauſted. Amontons.	2.8	34″	
A ſawyer made 200 ſtrokes of 18 inches Fr. each, in 145″, with a force of 25 pounds Fr. He could not have gone on above 3 minutes. Amontons.	6.	145″	
A man can raiſe 60 pounds Fr. 1 foot Fr. in 1″ for 8 hours a day. Bernouilli.	69.	8h.	.552
A man of ordinary ſtrength can turn a winch with a force of 30 pounds, and with a velocity of $3\frac{1}{2}$ feet in 1″, for 10 hours a day. Deſaguliers.	1.05	10h	1.05
Two men, working at a windlaſs with handles at right angles, can raiſe 70 pounds more eaſily than one can raiſe 30. Deſaguliers.	1.22		1.22
A man can exert a force of 40 pounds for a whole day, with the aſſiſtance of a fly, when the motion is pretty quick, as about 4 or 5 feet in 1″. Deſaguliers, lect. 4th. But from the annotation it appears to be doubtful whether the force is 40 pounds or 20.	2.		.2
For a ſhort time a man may exert a force of 80 pounds with a fly, "when the motion is pretty quick." Deſaguliers.	3.	1″	
A man going up ſtairs aſcends 14 metres in 1′. Coulomb.	1.182	1′	
A man going up ſtairs for a day raiſes 205 chiliogrammes to the height of a chiliometre. Coulomb.			.412
With a ſpade a man does $\frac{19}{20}$ as much as in aſcending ſtairs. Coulomb.			.391
With a winch a man does $\frac{5}{8}$ as much as in aſcending ſtairs. Coulomb.			.258
A man carrying wood up ſtairs raiſes, together with his own weight, 109 chiliogrammes to 1 chiliometre. Coulomb.			.219
A man weighing 150 pounds Fr. can aſcend by ſtairs 3 feet Fr. in 1″ for 15″ or 20″. Coulomb.	5.22″	20″	
For half an hour, 100 pounds Fr. may be raiſed 1 foot Fr. in 1″. Coulomb.	1.152	30′	
According to Mr. Buchanan's compariſon, the force exerted in turning a winch being made equal to the unit, the force in pumping will be	.61		
In ringing	1.36		
In rowing	1.43		
Allowing the accuracy of Euler's fora [illegible] firmed by Schulze,			

ſuppoſing

	Force.	Continuation.	Day's Work.
supposing a man's action to to be a maximum when he walks $2\frac{1}{2}$ miles an hour, we have $7\frac{1}{2}$ for his greatest velocity, $.64\ (7\frac{1}{2} - v)^2$ for the force exerted with any other velocity, and $.0160\ (7\frac{1}{2} - v)^2$ for the action in each case; thus, when the velocity is one mile an hour, the action is	.676		
When two miles	.964		
Three	.972		
Four	.784		
And when five	.5		

And the force in a state of rest becomes $2\frac{1}{4}$, or about 70 pounds; with a velocity of two miles, 36 pounds; with three, 24 pounds; and with four, 15.

It is obvious that in the extreme cases this formula is inaccurate, but for moderate velocities it is probably a tolerable approximation.

Coulomb makes the maximum of effect when a man, weighing 70 chiliogrammes, carries a weight of 53 up stairs, but this appears to be too great a load; he considers 145 chiliogrammes as the greatest weight that can be raised. He observes that in Martinique, where the thermometer is seldom below 68°, the labour of Europeans is reduced to one half.

Harriot asserts that his pump, with a horizontal motion, enables a man to do one-third more work than the common pump with a vertical motion.

Porters carry from 200 to 300 pounds at the rate of three miles an hour; chairmen walk four miles an hour with a load of 150 pounds each; and it is said that in Turkey there are porters who, by stooping forward, carry from 700 to 900 pounds placed very low on their backs.

The most advantageous weight for a man of common strength to carry horizontally is 111 pounds; or if he returns unladen, 135. With wheel barrows, men will do half as much more work as with hods. Coulomb.

Performance of men by machines.

	Force.	Continuance.	Day's Work.
A Man raised by a rope and pulley 25 pounds Fr. 220 feet Fr. in 145″. Amontons.	.436	.145″	
A man can raise, by a good common pump, a hogshead of water 10 feet high in a minute, for a whole day. Desaguliers.	.875		.875
By the mercurial pump, or another good pump, a man may raise a hogshead 18 or 20 feet in a minute, for one or two minutes.	1.61	1′	
In a pile engine, $55\frac{1}{2}$ pounds Fr. were raised one foot Fr. in 1″, for five hours a day, by a rope drawn horizontally. Coulomb.	.64	5^h	.82
Robison says, that a feeble old man raised seven cubic feet of water $11\frac{1}{2}$ feet in 1′, for eight or 10 hours a day, by walking backwards and forwards on a lever. Enc. Br.	.837	9^h	.753
A young man weighing 135 pounds, and carrying 30, raised $9\frac{1}{4}$ cubic feet $11\frac{1}{2}$ feet high, for 10 hours a day, without fatigue. Robison.	1.106	10^h	1.106
Wynne's machine enables a man to raise a hogshead 20 feet in a minute. Y.	1.75	1′	

Force of Horses.

	Force.	Continuance.	Day's Work.
Two horses, attached to a plough on moderate ground, exerted each a force of 150 Fr. Amontons. We may suppose that they went a little more than two miles an hour, for eight hours.	5.4	8	4.32
A horse draws with the greatest advantage when the line of direction is level with his breast; and he can draw with a force of 200 pounds, $2\frac{1}{2}$ miles an hour, for eight hours in the day.	7.33	8^h	5.87
With a force of 240 only six hours. On a carriage, indeed, where friction alone is to be overcome, a middling horse will draw 1000lb. Desaguliers.	8.8	6	5.28
The mean draught of four horses was 36 myriogrammes each, or 794 pounds. Regnier. This must have been momentary. Supposing the velocity two feet in a second, the action would have been	15.88	1″	
By means of pumps a horse can raise 250 hogsheads of water, 10 feet high, in an hour. Smeaton's Reports.	3.64	1^h	

A horse can in general draw no more up a steep hill than three men can carry, that is, from 450 to 750 pounds, but a strong horse can draw 2000 pounds up a steep hill, which is but short. The worst way of applying the force of a horse, is to make him carry or draw up hill: for, if the hill be steep, three men will do more than a horse, each man climbing up faster with a burden of 100lb. weight, than a horse that is loaded with 300lb. a difference which is owing to the position of the parts of the human body being better adapted to climb than those of a horse.

On the other hand, the best way of applying the force of a horse, is an horizontal direction, wherein a man can exert least force: thus a man, weighing 140lb. and drawing a boat along, by means of a rope coming over his shoulders, cannot draw above 27lb. or exert above one seventh part of the force of a horse employed to the same purpose.

The very best and most effectual posture in a man is that of rowing; wherein he not only acts with more muscles at once for overcoming the resistance than in any other position; but as he pulls backwards, the weight of his body assists by way of lever. Desaguliers.

The diameter of a walk for a horse-mill ought to be at least 25 or 30 feet. Desaguliers.

Some horses have carried 650 or 700 pounds, seven or eight

eight miles without reſting, as their ordinary work; and a horſe at Stourbridge carried 11 hundred weight of iron, or 1232 pounds for eight miles. Deſaguliers, Exp. Philoſ. vol. i.

	Force.	Continuance.	Day's Work.
Work of Mules. Cazanel ſays, that a mule works in the Weſt Indies two hours, out of about 18, with a force of about 150 pounds, walking three feet in a ſecond.	4.5	$2^h\ 40'$	1.2

Inanimate force.—According to M. Coulomb, a wind-mill with four ſails, meaſuring 66 feet Fr. from one extremity to that of the oppoſite ſail, and ſix feet wide, or a little more, is capable of raiſing 1000 pounds Fr. 218 feet in 1′, and of working on an average eight hours in a day. This is equivalent to the work of 34 men, as it has been above eſtimated, 25 ſquare feet of canvas performing about the daily work of a man.

Robiſon ſays, that a hundred weight of coals burned in a ſteam engine will raiſe at leaſt 20,000 cubic feet of water 24 feet high; this is equivalent to the daily labour of 8.32 men. A ſteam engine in London, with a 24-inch cylinder, does the work of 72 horſes, and a chaldron of coals in a day; each buſhel being equivalent to two horſes, and each ſquare inch of the cylinder performing nearly the work of a man.

If we calculate the quantity of motion produced by gun-powder, we ſhall find that this agent, though extremely convenient, is far more expenſive than human labour; but the advantage of gun-powder conſiſts in the great rarity of the acting ſubſtance. A ſpring or a bow can only act with a moderate velocity on account of its own weight. The air of the atmoſphere, however compreſſed, could not flow into a vacuum, with a velocity ſo great as 1500 feet in a ſecond. Hydrogen gas might move more rapidly, but the elaſtic ſubſtance produced by gun-powder is capable of propelling a very heavy cannon ball with a much greater velocity.

It is ſaid that nine tons of water, falling 10 feet, will grind and dreſs a buſhel of wheat; conſequently a man might do the ſame in 33′ 36″.

FORCE, *Accelerating.* See VIS *acceleratrix*, and ACCELERATION.

FORCE, *Attractive.* See ATTRACTION.

FORCE, *Central.* See CENTRAL.

FORCE, *Centrifugal.* See CENTRIFUGAL.

FORCE, *Centripetal.* See CENTRIPETAL.

FORCE *of Coheſion.* See COHESION.

FORCE, *Contractile.* See CONTRACTILE.

FORCE, *Elaſtic.* See ELASTIC, and ELASTICITY.

FORCE, *Electrical.* See ELECTRICITY.

FORCE *of Gravity.* See GRAVITY.

FORCE *of the Heart.* See HEART.

FORCE *of Inactivity.* See VIS *inertiæ.*

FORCE, *Innate.* See VIS *inſita.*

FORCE, *Magnetic.* See MAGNETISM.

FORCE, *Moving.* See VIS *motrix*, and preceding article, FORCE.

FORCE, *Repelling.* See REPULSION.

FORCE, *Reſiſting.* See RESISTANCE.

FORCE, *Retarding.* See RETARDATION.

FORCE *of Wind.* See WIND, &c.

FORCE, in *Common Law*, ſignifies an offence, by which violence is uſed either to perſons, or things.

Force is either *ſimple*, or *compound.*

FORCE, *Mixed* or *compound*, is violence committed with ſome fact, which of itſelf alone were criminal: as if any man by force enter into another man's poſſeſſion, and there kill a man or raviſh a woman, &c. See HOMICIDE.

FORCE, *Simple*, is that which has no other crime adjoined to it: if one, by force, enter into another man's poſſeſſion, without doing any other unlawful act.

FORCE is alſo divided into *true force*, or *force after a ſort.*

There are other branches; as forcible entries, forcible detaining, or holding unlawful aſſembly, routs, riots, rebellions, &c. See the ſeveral articles.

FORCE, *Freſh.* See FRESH.

FORCE, in *Grammar*, and ſome other arts, is applied to a thing which ſtands in lieu of, or has the ſame effect, as another. In our language the *ſ* between two vowels has the force or power of a *z*, and is ſometimes put for a *z*: as in horiſon, baptiſing, &c.

In Hebrew, the dageſh, and in Arabic, the teſdid, have the force of a letter ſuppreſſed. An unit before a cypher has the force of ten.

FORCE, Fr. and Eng. in *Muſic*, implies energy, ſtrength, loudneſs, intenſity. Force not only renders ſound more diſtinct, but audible at a greater diſtance; as the greater or leſs number of vibrations of a ſonorous body renders it more acute or grave, its greater or leſs deviation from the line of repoſe conſtitutes *loud* or *ſoft.* But if this deviation is too great, and an inſtrument or voice is forced, the ſound becomes noiſe, and ceaſes to be appreciable. To force the voice beyond its power, in order to be better heard in a large room or theatre, deſtroys all its proportions, by exceeding its diapaſon, or ſcale of ſounds, and becomes ſcreaming inſtead of ſinging. Forcing the tone has the ſame effect on inſtruments, whether their ſounds are produced by a bow, or by wind: and it is for this reaſon that the French ſo ſeldom ſing in tune. Rouſſeau.

FORCE, in *Painting*, is uſed to ſignify the degree of relievo of the objects in a picture, effected by the contraſt of colours employed either in oppoſition of hue, or of light and dark. In other words, it marks the degree of their approach in effect, to the natural appearance of the original in nature. Force, therefore, in this view, correſponds in meaſure with effect in painting (ſee EFFECT); but its uniſon with it is confined to this point alone.

Though it is a quality of a very uſeful kind when judiciouſly applied in a picture, it is by no means neceſſary to apply it always powerfully; as it will not only in ſome caſes be unavailing in giving value to the work, but may be of actual injury to its effect on the mind, in beauty and character of expreſſion; *e.g.* in ſubjects of a tender and delicate nature. In them the poſitive relievo of objects, which great force implies, would rather produce diſguſt, than afford delight; and inſtead of giving the ſoft and pleaſing expreſſion of their nature, would, by impoſing itſelf too powerfully on the ſight, deſtroy the effect moſt deſirable to be produced.

Even in portraits, particularly of ladies where the expreſſion is of a mild and amiable character, too eager a deſire to produce the appearance of *reality* or *force*, by deſtroying the beauty, renders the work unpleaſant. The object is more agreeably viewed, when ſeen through a ſlight degree of miſt, or when the tones of ſhade are weakened by a ſlight medium of air paſſing between the object and the obſerver.

In thoſe of men in general, particularly if their characters are ſtrongly marked, of a bold or grand kind, and expreſ-

fion of truth, more than beauty, is aimed at, too much force cannot be given to them. A full and rich relievo heightens their importance, and gives a dignity to the other qualities of the work, which, without that, would be tame and infipid, when compared with the originals in nature.

Its utility is very great in fubjects of horror, wherein ftrong contrafts of light and fhade aid the effect of the fubject, and ftrengthen its impreffion on the mind. In thofe of ordinary intereft, and in all reprefentations of ftill life, it cannot fail of being beneficial; where the nearer the objects approach in brilliancy of effect to nature, the more perfect is the work.

It is beft produced by ufing a ftrong contraft of light and dark; but mere contraft alone will not produce it perfectly; a delicate gradation of fhade and hue muft be given, and great attention paid to the rounding of the parts to give relievo; for it is upon the relievo that force depends.

The moft powerful, and the fimpleft mode of obtaining force, is by laying a light figure on a dark ground; particularly if the figure is compofed of ftrong and vivid colours, fuch as red, or yellow, aided by white; and with fome of the fhadows darker than the ground. This contraft, properly perfected in the execution, will produce deception; giving the appearance of a complete detachment of the figure from the ground: efpecially if feen under favourable circumftances, and the boundary of the picture is hid.

But it is not on this kind of contraft alone that force depends; it has been often produced by fkilful mafters, with thofe of a lefs violent nature, at leaft not fo confpicuoufly employed for the purpofe. A picture muft, however, in order to poffefs it, have great oppofition in its parts; although it is not neceffary that thofe parts of different qualities come into immediate contact.

The moft effective examples of this quality in painting among the old artifts, are the works of Michael Angelo, Carravaggio, and Spagnoletto. But they have been both furpaffed by our late royal academician Opie; whofe figures in many of his hiftorical works appear actually relieved from the canvas, and embodied. But whatever degree each of thefe artifts has added of fingularity to painting, they have not increafed its beauty, nor heightened its effect in fublimity of expreffion, by the degree of force they have given to their works.

The gratification of the mind in beholding the cartoons of Raphael, when the eye is accuftomed to their imperfect colouring, is a clear proof, that painting is not indebted to force for its moft powerful fenfations on the human mind; though, when properly employed, it is a very valuable affiftant to the other more valuable parts of the art.

FORCELLER, in *Geography*, a town of Naples, in Abruzzo Ultra; 3 miles E. of Teramo.

FORCEPS, in *Agriculture*, is a term which is applied to a fort of tool of the nipper kind, that is frequently employed in weeding broad-caft crops of corn, or other forts; and which may be ufed for various other purpofes.

FORCEPS, in *Midwifery*, an inftrument ufed to facilitate the birth of the child, when the head is too large to pafs readily through the pelvis of the mother, and to effect this object without doing injury to either party. The forceps confifts of two feparate pieces, or blades; each of them, including the handles, about twelve inches in length; curved at their upper ends, to accommodate them to the fhape of the head of the child; and at the end of the curvature, where the handles commence, furnifhed with a contrivance, by which they may be united, or locked together, fo as to act as one inftrument in moving and bringing down the head of the child. In ufing the forceps, the accoucheur is to pafs two or three fingers, generally of the right hand, into the vagina, along the fide of the head of the child, over the ear, if practicable; and then, with the other hand, direct one of the blades of the forceps, anointed with lard, between his fingers and the head, keeping the handle of the inftrument back towards the anus of the woman. Having pufhed up the blade beyond the ear of the child, he then withdraws his fingers, keeping the inftrument fteady in the paffage, and proceeds to pafs the other blade over the other ear of the child, directly oppofite to the firft. The handles of the forceps are now to be brought together, and locked; taking care that neither the hair nor any of the foft parts of the woman are included. The handles muft alfo be tied together, that in the courfe of extracting the child, which muft be done flowly and gradually, they may not flip from the head, and fubject you to the trouble of replacing them.

Some fpecies of forceps appear to have been very early introduced into the practice of midwifery, as we find them mentioned by Hippocrates, and afterwards by Avicenna. They were probably intended to fuperfede the ufe of hooks, and various cutting inftruments, with which it had been ufual to open and reduce the fize of the head of the child, when it was too large to pafs through the brim of the pelvis. They were the fame as thofe ufed by furgeons in removing fplinters of bones; were generally armed with teeth, and the blades were united by a fixed joint. The two blades were, therefore, neceffarily introduced into the vagina together, and there opened to take hold of the head of the child. In this way, befides the danger, almoft inevitable, of lacerating the os uteri of the woman, the fcalp of the child was liable to be bruifed and torn; and, if the refiftance was confiderable, the bones of its fkull to be crufhed, and its life to be deftroyed.

Such muft have been the cafe on ufing the forceps defcribed and delineated by Albucafis, who is fuppofed to have lived about the beginning of the twelfth century, 100 years after Avicenna; or thofe defcribed by Ruett, furgeon at Zurich, in his book "De Conceptione et Generatione Hominis," publifhed in 1554. Great credit is therefore due to Dr. Chamberlen, (fee his life,) who firft conceived the idea of making a pair of forceps, fuch as has been defcribed above, confifting of two moveable blades, that were to be introduced feparately into the uterus, and to be united and locked together, after they had taken hold of the head of the child. This was about the year 1672.

Chamberlen carefully abftained from giving any defcription of his invention. He does not even intimate it was an inftrument. In his tranflation of "Mongeicrans Practica des Accouchmens," publifhed in 1683, he fays, "My father, brothers, and myfelf, (though none elfe in Europe that I know,) have, by God's bleffing, and our induftry, attained to and long practifed a way to deliver women, when the head of the child, on account of fome difficulty, or difproportion, cannot pafs, without any prejudice to them or their infants," &c. Chapman firft publifhed a delineation and defcription of the forceps, with the method of ufing them, in his Treatife on the Improvement of Midwifery, publifhed in 1732. (See the article *Edmund Chapman.*) He made fome improvements, he fays, in their form. They have fince been in general ufe, and have received various alterations, according to the fancy of different practitioners, particularly by M. Levret, by Dr. Johnfon, and Dr. Ofborne. But the moft material and valuable improvements were made by Dr. Smellie, who gave them the hinge, or lock now generally ufed; and who fimplified their ftructure, and reduced them confiderably in

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fize, which has added much to the facility and fafety in ufing them. See his treatife on the Theory and Practice of Midwifery. For a more minute and particular account of the cafes in which the forceps are indicated, and of the method of applying them in every poffible pofition of the head of the child, the reader is referred to Dr. Denman's excellent Introduction to the Practice of Midwifery, and to his Aphorifms on the Application and Ufe of the Forceps and Vectis, which are, it is to be prefumed, in the hands of every practitioner in the art. For a delineation of the forceps, fee *Plate of Midwifery*.

FORCEPS, in *Surgery*, is an inftrument much employed for feveral purpofes, and having accordingly various conftructions. However, the general defign of every furgical forceps is to take hold of fubftances, which cannot be conveniently got at with the fingers; and, of courfe, the inftrument is always formed on the principle of a pair of pincers, having two blades, either with or without handles, according to circumftances.

The fmalleft forceps is that which is employed in the operation of extracting the cataract, and which is ufeful for removing any particles of opake matter from the pupil, after the chief part of the cryftalline lens has been taken away.

Another forceps of larger fize is that ufed for taking up the mouths of the arteries, when it is neceffary to tie thefe veffels, in order to ftop hemorrhage. This inftrument is alfo frequently employed for taking dreffings off fores, removing pieces of dead bone, foreign bodies from wounds, &c. It refembles the forceps contained in every cafe of diffecting inftruments, and is reprefented in the furgical plates. See *Plate* II.

Neither of the foregoing forceps is made with handles; each opens by its own elafticity; and the ends of the blades only come into contact when preffed together by the furgeon's fingers.

The following kinds of forceps are conftructed with handles, by means of which they are both opened and fhut:

1. The common forceps, contained in every pocket cafe of furgical inftruments, and ufed for removing dreffings from fores, extracting dead portions of bone, extraneous fubftances, &c.

2. Larger forceps employed for extracting polypi from the nofe. See POLYPUS.

3. Forceps of different fizes and conftructions, ufed in the operation of lithotomy, for taking the ftone out of the bladder, after an opening has been made into this organ. Alfo, another very ftrong forceps with teeth, for breaking fuch calculi as are too large to admit of being extracted whole. See plates.

FORCER, in *Mechanics*, is properly a pifton, without a valve.

There are feveral ways of making forcers: the moft common of all confifts of a brafs cylinder, a very little lefs in diameter, at its bottom and top, than the bore of the barrel of the pump, and turned ftill lefs at the middle, in order to let in a leathern ring or collar (made of a thick leather put round the brafs cylinder), which makes it juft equal to the bore of the barrel, fo as to fit it quite when it is put into it.

The fecond fort of forcers confifts of three brafs cylinders, which can be fcrewed together. The middle one ought to be almoft equal in diameter to the bore of the pipe, fo as to flide in it without any friction. The upper cylinder and the lower muft be a little lefs, and equal to one another. There are two leathers which muft be put between them when they are unfcrewed: then it is evident, that if the cylinders be fcrewed together, and the leathers, which ought to be a little bigger than the brafs cylinders, apply themfelves folding upwards round the upper cylinder, and downwards round the lower, they will become juft equal to the bore of the barrel; and confequently they will hinder any air from getting through the fides of the forcer, when it moves up and down in the barrel. The ufe of the middle brafs cylinder is to hinder the leathers from turning themfelves back by the motion.

This kind of forcer has, above the other, the advantage of having a great deal lefs friction; and befides, as the leathers, which are applied to it, may be thin ones, they are much fmoother than thick ones, which are ufed in the other.

But the beft way of making forcers is to have a plunger, or folid brafs cylinder, equal in length to the barrel of the pump, and a little lefs in the diameter than the bore, fo that it may move freely in it without any friction. There muft be two hollow, fhort, brafs cylinders, or rather rings, at the top of the barrel, which can be fcrewed together; the upper one muft be equal in bore to the barrel, and the lower a little lefs: there are two leathers, both having in the middle a lefs hole than in the bore of the pipe; the one muft be applied between the barrel and the lower ring, and the other between the fame ring and the upper one; and the whole muft be fcrewed together. Then if the folid cylinder or forcer be put into it, and moved up and down, it is evident that the two before-mentioned leathers, which are applied the one to the barrel and the other to the infide of the hollow cylinder, will hinder any air from getting between them and the folid cylinder.

The advantage of this kind of forcer is, that it has no other friction but at the top of the barrel, and that the infide of the barrel need not be fmooth, as in other kinds of pumps; but only the outfide of the forcer muft be turned true and polifhed, which can be done with much more eafe, and the lower part muft be turned a little conical, that it may be brought into the barrel, without any refiftance of the upper leather of the collar or jack-head. See Defaguliers, Courfe of Experim. Philof. vol. ii. p. 161, 162.

FORCHEIM, in *Geography*, a town of Germany, in the bifhopric of Bamberg, on the Wifent; 12 miles S. of Bamberg. N. lat. 49° 43′. E. long. 11°.—Alfo, a town of Germany, in the circle of Erzgeburg; 4 miles N. N. E. of Lauterftein.

FORCHEN-SEE, a lake of Bavaria; 10 miles S. of Traunftein.

FORCHTENBERG, a town of Germany, in the principality of Hohenlohe, fituated on the Kocher; 6 miles N. N. E. of Ohringen.

FORCHTENSTEIN, a town of the duchy of Stiria; 3 miles S. of Windifch-Gratz.

FORCIBLE ENTRY, a violent, actual entry into houfes, or lands, &c. with menaces or weapons, whether violence or hurt be offered to any perfon therein, or not. And forcible *holding*, or *detaining*, a withholding by violence, and with a ftrong hand, of the poffeffion of land, &c. whereby he who has a lawful right of entry is barred or hindered. See ENTRY.

This was formerly allowable to every perfon diffeifed, or turned out of poffeffion, unlefs his entry was taken away, or barred by his own neglect, or other circumftances. But this being found very prejudicial to the public peace, it was thought neceffary, by feveral ftatutes, to reftrain all perfons from the ufe of fuch violent methods, even of doing themfelves juftice: fo that the entry now allowed

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by law is a peaceable one. By the ſtatute 5 Ric. II. ſt. 1. c. 8. all forcible entries are puniſhed with impriſonment and ranſom at the king's will. And by the ſeveral ſtatutes of 15 Ric. II. cap. 2. 8 Hen. VI. cap. 9. 31 Eliz. cap. 11. and 21 Jac. I. cap. 15. upon any forcible entry, or forcible detainer after peaceable entry, into any lands, or benefices of the church, one or more juſtices of the peace, taking ſufficient power of the county, may go to the place, and there record the force upon his own view, as in caſe of riots; and upon ſuch conviction, may commit the offender to gaol, till he makes fine and ranſom to the king. And the juſtice or juſtices have power to ſummon a jury, to try the forcible entry or detainer complained of; and if the ſame be found by that jury, then, beſides the fine on the offender, the juſtices ſhall make reſtitution by the ſheriff of the poſſeſſion, without inquiring into the merits of the title; for the force is the only thing to be tried, puniſhed, and remedied by them; and the ſame may be done by indictment, at the general ſeſſions. But this proviſion does not extend to ſuch as endeavour to maintain poſſeſſion by force, where they or their anceſtors have been in the peaceable enjoyment of the lands and tenements for three years immediately preceding. Holding over by force, where the tenant's title was under a leaſe, now expired, is ſaid to be a forcible detainer. (Cro. Jac. 199.)

Forcible *abduction* and *marriage*, vulgarly called "ſtealing an heireſs." By ſtat. 3 Hen. VII. cap. 2. it is enacted, that if any perſon ſhall, for lucre, take any woman, being maid, widow, or wife, and having ſubſtance, either in goods or lands, or being heir apparent to her anceſtors, contrary to her will; and afterwards ſhe be married to ſuch miſdoer, or by his conſent to another, or defiled; ſuch perſon, and all his acceſſaries, ſhall be deemed principal felons: and by ſtat. 39 Eliz. cap. 9. the benefit of clergy is taken away from all ſuch felons, who ſhall be principals, procurers, or acceſſaries before the fact. See Marriage.

FORCING, in the *Wine-trade*, a term uſed by the wine-coopers for the fining down wines, and rendering them fit for immediate draught. See Fining.

The principal inconvenience of the common way of fining down the white wines by iſinglaſs, and the red by whites of eggs, is the ſlowneſs of the operation; theſe ingredients not performing their office in leſs than a week, or ſometimes a fortnight, according as the weather proves favourable, cloudy or clear, windy or calm: this appears to be matter of conſtant obſervation. But the wine-merchant frequently requires a method that ſhall, with certainty, make the wines fit for taſting in a few hours. A method of this kind there is, but it is kept in a few hands a valuable ſecret. Perhaps it depends upon a prudent uſe of a tartarized ſpirit of wine, and the common forcing, as occaſion is, along with gypſum, as the principal; all which are to be well ſtirred about in wine, for half an hour before it is ſuffered to reſt. Shaw's Lectures, p. 208.

Forcing, in *Gardening*, is the art of raiſing and producing plants, flowers, and fruits, at an earlier ſeaſon than the natural one, by means of artificial heat. It is accompliſhed, either by the gentle moiſt heat that is evolved during the fermentation and decompoſition of ſtable-dung, tanner's bark, leaves, and other ſimilar materials, or by the uſe of actual fire in ſtoves, flues, pits, and other contrivances formed for the purpoſe of producing ſuch effects.

It is the former of theſe methods that is principally employed in raiſing cucumbers, melons, and ſome other fruits; and the latter which is made uſe of in producing pine-apples, various kinds of wall-fruits, and ſeveral other ſorts of vegetable productions of the early fruit, or other kinds.

It may be obſerved, that the great difficulty in the management of this proceſs is that of adapting and regulating the heat, of whatever ſort it may be, in ſuch a manner as to promote and bring forward the plants, flowers, or fruits in the moſt perfect and healthy growth and ſtate of production, without their ſuſtaining any check or injury either by a deficiency or exceſs.

The various methods of effecting this in the moſt perfect manner are fully deſcribed under the culture of the different trees, plants and vegetables that require ſuch treatment in their growth, and production of fruit.

It is by this proceſs that different ſorts of rare vegetable productions, fruits and flowers are afforded at much earlier periods than could otherwiſe be the caſe; it of courſe conſtitutes an important branch of practical gardening in the preſent improved ſtate of the art; and is applicable in a variety of intentions, as ſhewn and deſcribed in the way hinted above. See Cucumis, in *Gardening*.

Forcing-*frame*, that kind of large frame-work or other erection which is made uſe of in procuring different ſorts of vegetables, fruits, and flowers at an early period by the application of artificial heat in ſome of the modes uſually employed. It is a ſort of conſtruction that is covered with ſloping glaſs ſliding frames on the top, and ſometimes in the front. It may be either fixed or moveable, but in the former caſe the walls are moſtly made of brick work, or ſome other hard durable material.

Theſe ſorts of forcing frames are uſually contrived ſo as be placed full to the ſouth ſun; and their lengths may be various, from ten to fifty or even one hundred feet; the widths being from five to fifteen, and from five to ten in height; having an upright back-wall, of wood, where they are ſmall, but when large, of brick, with a front of glaſs-work, made ſometimes in one continued range of ſlope to the top of the back-wall; and ſometimes with upright glaſs-work, head high, ranging immediately along the front, and from the top of which a glaſs roof is carried to the top of the back or main wall: when the frames are wrought by dung-heat, it is chiefly applied againſt the outſide of the back wall, and by being formed into a bed internally; but when by bark-heat, by forming it into a bed in a pit within-ſide the frame; and when by fire heat, by having ſeveral returns of flues formed againſt the inſide of the back-wall, and ſometimes againſt thoſe of the front and both ends, for the heat to paſs along, conſtructed with proper fire places, according to the ſorts of plants that are chiefly intended to be forced, and the nature of the materials to be employed in producing the heat that may be requiſite.

In caſes where the firſt kind of material is employed in affording heat, the frame is uſually formed with an upright back and ends of deal planking, and a ſloping front of moveable glaſs-lights; the length being ten, twenty, or thirty feet, or more in different pieces; the width, from three to five or more, and five or ſix in height; the frame work being of inch and half deal planking, tongued, and cloſely joined, that no ſteam from the dung may penetrate into the frame; and raiſed five, ſix, or ſeven feet in height behind, but only ten or twelve inches in front, both ends being made anſwerable to the front and back; the glaſs-work ranging from the upright in front, ſloping upward towards the back-wall, to about a foot width at the top, where the ends ſhould reſt upon a proper frame-work of wood; and bars or bearers, three inches in width, placed in

a ſloping

a ſloping manner from the back to front, for the ſupport of the lights, as in common hot-bed frames; the top of all being boarded and made wind and water tight. The frames have ſometimes within-ſide them two or three ranges of narrow ſhelves fixed up along the back and ends, for pots of ſmall plants, and the bottom levelled, on which to place pots of larger kinds; theſe ſhelves may alſo be made in a riſing manner one behind another quite from the front half way up the back wall, in order to place the loweſt plants in front and the others in order behind them, riſing gradually to the talleſt in the back rows of the frames.

In managing the working of theſe frames, after having placed the pots of plants in regular order, the lights are put on, and a ſufficient quantity of freſh hot ſtable-dung, prepared as for common dung hot-beds, is to be piled up cloſe againſt the outſide of the back and ends, a yard in width at bottom, drawing it gradually into a foot in width at the top, and finiſhing it ſomewhat in a ſloping manner to throw off the wet: as the dung ſettles or ſinks down, a freſh ſupply muſt be added at the top, to maintain the linings to the full height of the frame; additions being occaſionally made of freſh dung as the heat declines, by which means a fine growing heat will be thrown into the frame. See Hot-*bed.*

In caſes where bark is made uſe of in producing the heat, the frame may be conſtructed either of wood or brick-work, and fronted, &c. with ſaſhes of glaſs, as in the former; the length being ten, twenty, or thirty feet, or more; eight or ten in width, and ſix or eight in height; and, like the dung-heat frame, be ſix or eight feet in height behind, and one in front, the ends being made conformable and ſloping, having glaſs work frames raiſed from the front in a ſloping manner, either quite to the top of the back-wall, or inclined only about one half towards that part, meeting a tiled roof at top half way, which ſhould be raiſed high enough in front to throw the water off behind, as well as to admit as much ſun as poſſible to every part of the frame: it may likewiſe be conſtructed with an upright front of glaſs, head high, and a ſloping roof of glaſs-work, ranging from the upright front to the top of the back wall, which is the moſt eligible form, both for convenience and benefit of the plants; either of which conſtructions may be erected detached, or againſt a ſouth wall already built, which will ſerve for the back, and ſave ſome expence; the ends may either be of wood or brick, and ſhould be glazed like the front, &c. and the glaſs-work in every part be made to move on and off, as well as to ſlide backward and forward to give air, and perform other neceſſary work. At one end, near the back-wall, a door ſhould be made to enter occaſionally at, and within-ſide a pit formed for the bark-bed, three feet deep, partly ſunk, but the greater part raiſed, being continued the whole length and width, except about a foot and a half of alley to paſs in, to perform the neceſſary culture, as well as view and gather the produce of the different plants, &c.

The pit within is to be filled with new bark or tan, in order to afford a proper heat for the growth and ſupport of the plants that are to be cultivated in the frame. See Hot-*bed.*

The frame where fire-heat is to be employed muſt be formed of brick-work; at leaſt the back or main wall, for the convenience of having fire-flues, and the whole front, &c. be glaſs, like the other ſorts; the length may be from twenty to forty or fifty feet, or more, though one fire will not warm more than that length; the width from five or ſix to twelve or fifteen feet, and eight or ten in height. In this caſe the fire is burned in a furnace ſet up behind, at one end, or in the middle, thence communicating the heat by internal flues or funnels running the whole length of the back wall in three or four returns one above another, and continued in one or two flues in the front. And frames, thus conſtructed, may be contrived, either of moderate width, for one row of trees only, to range againſt the back wall, or may be made capacious enough to have a range of trained wall-trees behind, and ſome ſmall half, or full ſtandards, ranging alſo from the back to the front; or be entirely for ſtandards, eſpecially thoſe of cherry kinds.

Where it is intended to have a narrow frame, for only a row of trained trees behind, the width of from four to five or ſix feet is ſufficient, having the back or main wall formed of brick or ſtone, as juſt obſerved, eight or ten feet in height, with ſeveral flues within-ſide, returned over each other, running the whole length of the wall; in the front muſt be a low wall a foot in height, on which to lay a plate of timber, and from which are ranged glaſs frames, or lights in one continued ſlope to the top of the back wall, there received into a proper frame-work; but for the greater convenience, the lights may be in two tiers or ranges, an under and upper tier, the upper range being made to ſlide up and down over the others, but ſo that all the glaſs-work can be moved away occaſionally, to admit full air to the trees after the work of forcing is over: the whole of the bottom-ſpace within the frame ſhould be of good loamy earth, or any good garden-mould, two ſpades deep, which ſhould be dug or trenched in the common way; then a range of trees planted behind, towards the wall, two or three yards aſunder, erecting a trellis behind them, upon which to train the branches, as againſt a wall or eſpalier. Other inferior plants may likewiſe be ſet in the border or in pots, in front of the trees in the frame.

In moſt forcing frames of this conſtruction, from forty to fifty feet length may be ſufficient; but if they be made longer, two furnaces for fires are neceſſary to heat them properly. See Hot-*Houſe.*

Several different ſorts of frames of this nature may be ſeen in the appropriate plate.

With the firſt ſort of forcing-frame, various kinds of fruits may be produced, both of the dwarf-fruit-tree and other kinds, as well as different ſorts of vegetables and plants of the flowery and other kinds. And frames of this ſort may have ſuch dimenſions as to have ſubſtantial hot-beds prepared within them, for the purpoſe of receiving many different ſorts of potted plants.

But in the ſecond ſort of frame, from the heat being more regular and laſting, a ſtill greater variety of the finer ſorts of fruits, and the more tender flowers and other vegetable productions may be produced, not only long before they could be raiſed in any other way, but with much greater eaſe and convenience, as well as with greater certainty and ſucceſs.

And the laſt kind of forcing-frame is moſtly employed in furniſhing many of the finer ſorts of fruits, that require higher degrees of heat to procure them in the utmoſt perfection, than could otherwiſe be obtained; ſuch as pine-apples, grapes, peaches, nectarines, and various others, as well as many tender ſorts of vegetables, and numerous plants of the curious flower and other kinds. See Hot-*Houſe.*

Forcing-*ground*, the ſpace or portion of ground in a garden that is deſtined to the purpoſe of forcing or raiſing vegetable productions by means of artificial heat. Grounds of this ſort ſhould always be detached from the garden, and ſituated as near to the ſtable as the nature of the land will admit, in order that dung may be conveyed to them with

with as much eafe and convenience as poffible, litter prevented, and the difagreeable appearance of the beds concealed from the fight.

It is effentially neceffary in moft fituations, and particularly in fuch as are expofed, to have thefe grounds inclofed with a fence, either of brick-work or paling, fix or eight feet in height. They fhould have fufficient fpace for containing a fuitable number of frames and pits, and fuch linings as may be neceffary in the working of them. And it is of great advantage in raifing many forts of tender crops, both of the vegetable and fruit kind, to have four or fix-feet borders made round them in a raifed manner; as in fuch fituations much fhelter and warmth are afforded.

In cafes where melons are raifed, it is ufual to have brick pits coped with ftone or wood. Thofe which are moft convenient, according to Mr. Forfyth, are fuch as are about twelve feet in width and two and a half in depth; the length in proportion to the number of frames employed. They are, however, often made of much fmaller dimenfions, efpecially where the extent of forcing-ground is but fmall and limited. With regard to the fize of the lights for early melons, the above author advifes, that they fhould be five feet in length and three in breadth; and for others, fix feet in length and four in breadth, the former being four and the latter three light boxes. See FRAME, *Garden.*

It is found that in conftructing the pits, nine-inch walls will be fufficient, fquare pieces of wood being built in the upper parts of them, where wood copings are made ufe of to nail them to. As wood decays rapidly, ftone fhould be preferred. Sometimes the walls are not built folid, but fquare openings left, fo as to admit the heat from the outfides, as fhewn in the plate on forcing-frames.

It is directed by Mr. Forfyth, that there fhould be a track or walk between the ridges of about fix or feven feet in breadth, fufficient to admit a cart to carry dung, as being more expeditious than wheeling it in. This walk fhould be made up as high as the coping, and floping gently towards each end, being laid in the bottom with brick-rubbifh, and covered over with fea-coal afhes or fand. By this means, after the linings are made up, it may be kept perfectly neat and clean. A loofe drain will likewife be neceffary in the middle of the bottom of the pit, for conveying off wet and the oozing from the dung, to a tank or ciftern conftructed for its reception. The fluid thus collected may be made ufe of in watering cabbage and other plants of the fame kind in the kitchen garden.

FORCING-*pit*, a fort of pit conftructed of brick-work, with fire-flues, in various ways, according to circumftances, for the purpofe of making tan or other forts of hot-beds, and being covered with glafs frames.

This fort of pit is ufeful for receiving different forts of tender potted plants which require confiderable degrees of heat in their cultivation and growth. See BARK-*pit.*

FORCING-*wall*, a wall conftructed with flues for the purpofe of conveying and communicating fire-heat, in order to ripen, at an earlier period than ufual, various kinds of tree-fruits that are planted and trained againft it; and which are protected in the front by glazed frames fixed againft it. See HOT-*wall.*

Walls of this fort fhould always be erected in warm fheltered fituations, and have foutheru afpects, in order that they may derive the greateft poffible advantage from the genial heat and influence of the fun and air.

FORCING *Pump.* See PUMP.

FORCKENDORP, in *Geography*, a town of Germany, in the principality of Bayreuth; 4 miles S.S.W. of Bayreuth.

FORCULUS, *quafi à Foribus*, in *Mythology*, a divinity who prefided over the gates of houfes.

FORD'S ISLAND, in *Geography*, a fmall ifland in the Atlantic, near the coaft of South Carolina. N. lat. 33° 14'. W. long. 79° 5'.

FORDEN, a town of Germany, in the bifhopric of Bamberg; 7 miles E.S.E. of Weifchenfeld.

FORDERGERSDORF, a town of Germany, in the circle of Erzgeburg; 9 miles E.N.E. of Freyberg.

FORDICIDIA, or FORDICALIA, in *Antiquity*, a religious feaft, among the Romans, held on the fifteenth of April; thus called from the Latin, *forda*, a cow big with calf; and *cædo*, I flay, or facrifice; becaufe fuch cows were herein facrificed to the goddefs Tellus, or the earth.

Forda, a cow with calf, is formed, according to Ovid, from *fero*, I bear; or rather, as Scaliger and Salmafius imagine, from the Greek φοϱας, φοϱαδος, the fame.

Varro writes, that there were feveral of thefe cows facrificed in the Curiæ. And Livy and Halicarnaffeus relate, that there was one in each Curia; fo that there were thirty in all; which is confirmed by Ovid. Faftor. lib. i. ver. 631.

The fordicidia were firft inftituted by Numa, on occafion of a general barrennefs among the cattle. Ovid gives a particular defcription of the ceremony, in the paffage above quoted; he adds, that part of thefe cows were facrificed in the temple of Jupiter; that is, in the Capitol.

FORDINGBRIDGE, in *Geography*, a market town, which gives the name to the hundred in the divifion of New Foreft weft, in the county of Hants, is pleafantly fituated on the banks of the river Avon, over which there is a good ftone bridge of feven arches, and on the weftern verge of the foreft. The place is noticed as having two mills, and a *church* at the time of the Norman furvey. Formerly it appears to have been much larger than it now is; and its prefent diminutive fize is attributed to frequent fires, by which at times it has feverely fuffered. From the returns under the population act in 1801, the number of houfes was 461, containing 2335 inhabitants; of whom 892 are reported as occupied in trade, principally in calico-printing, and the fabrication of bed-ticking. Here is alfo a fmall manufacture of checked linens. The town is governed by a conftable, chofen annually at the court leet, held by the lord of the manor; and the weekly market is kept on Fridays. From its adjacency to the romantic fcenery of the foreft, it has to boaft of numerous and handfome feats in its vicinity. See Beauties of England and Wales, and Gilpin's Obfervations on the Coafts of Hants, &c.

FORDINGIANO, a town of the ifland of Sardinia; 22 miles S.E. of Bofa.

FORDOUN, or FORDUN, a parifh in Kincardinefhire, forming part of the far-famed vale of Strathmore, contains the villages of Auchinblæ and Kincardine; the latter of which gives name to the county, and was long the principal town, till James VI. removed the courts of juftice to Stonehaven; fince whofe reign, that has continued to be the county town. In this parifh are the veftiges of a large Roman encampment, and the ruins of an antiquated caftle, fuppofed to have been a royal palace, and once the refidence of Kenneth III. a prince diftinguifhed in Scottifh hiftory. By the returns made to government in 1801, Fordoun contained 465 houfes and 2225 inhabitants, 909 of whom were reported as employed in trade and agriculture.

At Auchinblæ was born the celebrated philologift and philofopher, lord Monboddo, well known in the literary world by his knowledge of the Greek language, and the intimate acquaintance he poffeffed with the writings of the ancients,

ancients. His "Origin and Progrefs of Language," in fix volumes, 8vo. contains a fingular fyftem, which fuppofes all words to be derived from certain primitive *monads*, compofed of vowel diphthongs. The "Hiftory of ancient metaphyfics," in fix volumes, quarto, contains opinions equally novel or eccentric. Fordoun alfo was the native place, and gave the name to

Fordoun, Johannes de, in *Biography*, a celebrated Scottifh hiftorian, who flourifhed in the fourteenth century. His work, entitled "Scotichronicon," after all the attacks which have been made upon it by various writers, and the ridiculous light it was held up by Buchanan, is ftill the moft complete and authentic hiftory extant of the early affairs of Scotland. Like many other excellent writers, in the early and middle ages of the annals of this ifland, Fordoun has had great injuftice done him by continuators and tranfcribers. Bowyer, his difciple and friend, it has now been afcertained, was the author of fome of the books long afcribed to Fordoun; and many interpolations and additions totally irrelevant, or contradictory to the tenor of the original work, are attributable to the fame prolific fource of unfounded or unfupported narrative. An edition of his works was publifhed in folio, by Goodal, at Edinburgh; but the beft, collated with numerous manufcripts, is one in fix volumes, royal 8vo. with a preface by Hearne, printed at Oxford. See Gen. Biog. Dict. and Hearne's Prefatio.

FORDSAND, in *Geography*, a fmall ifland of Denmark, near the coaft of Slefwick, in the German ocean. N. lat. 55° 1'. E. long. 8° 35'.

FORDWICH, a town of England, in the county of Kent, feated on the Stour; appearing to be a mean village, but governed by a mayor and jurats. It is a member of the town and port of Sandwich, and enjoys the fame privileges as the Cinque Ports. The river is navigable for fmall veffels; four miles N.E. of Canterbury, and 60 E. of London.

FORDYCE, David, in *Biography*, was born at Aberdeen in the year 1711, where he received his education, firft in the grammar fchool, and then at Marifchal college, where he made great proficiency in the Greek language, in philofophy, and in the mathematics. In 1728, when he was but feventeen years of age, he was admitted to the degree of mafter of arts. He next applied himfelf to divinity, which he cultivated with peculiar ardour, and was licenfed as a preacher, but never undertook the charge of a congregation in his native country. For fome time he officiated as domeftic chaplain to John Hopkins, efq. of Britons, near Rumford, Effex, who had a regular fervice every Sunday in the chapel at his own houfe. In the year 1742 he was chofen profeffor of philofophy in the Marifchal college at Aberdeen. Here he read lectures on natural hiftory, chronology, Greek and Roman antiquities, and on the feveral branches of natural and experimental philofophy. In 1745 and 1748 he publifhed his "Dialogues concerning Education;" which, though by no means a fyftematic treatife on the fubject, contain difcuffions of the principal points relative to education, as alfo of various queftions on fubjects of tafte and polite literature. He was author of the treatife on moral philofophy contained in the Preceptor, which was afterwards given to the world in a diftinct volume, 12mo., and has fince paffed through feveral editions. In the year 1750 he made a tour on the continent, with a particular view to examine the remains of ancient art at Rome, and in the following year he meant to return to his native country, but was fhipwrecked and loft his life in a ftorm on the coaft of Holland. Thus ended the career of a man who had excited the higheft expectations of the future benefits to be derived from his talents and learning; he had reached only his forty-firft year. His brother James publifhed, from a manufcript left behind him, his "Theodorus, a dialogue concerning education." In fpeaking of this work, a contemporary writer obferved, "that the piety of the writer appears to have been manly and rational; his fentiments of the divine perfections exalted and amiable; his knowledge of human nature, and of the various ways of touching the human heart, very extenfive; and his eloquence natural and affecting." This dialogue has been repeatedly reprinted, and in every edition, excepting the firft, has been joined with Dr. Fordyce's fermon on the eloquence, and his effay on the action proper for the pulpit. Another pofthumous work of Mr. Fordyce was "The Temple of Virtue, a Dream;" it was publifhed by his brother in 1757, who added to the defcriptive part twelve characters that had a claim to a place in it. Gen. Biog.

Fordyce, James, younger brother of the preceding, was born at Aberdeen in 1720. He received his claffical education at the public grammar fchool, and purfued the ftudies neceffary for a minifter of the gofpel at Marifchal college. His firft appointment was to the place of fecond minifter in the collegiate church of Brechin, in the county of Angus. After continuing there fome years, he accepted a call to Alloa, near Stirling. The people of this parifh were prepoffeffed in favour of another, to the prejudice of Mr. Fordyce, yet by his impreffive delivery, and indefatigable attention to every part of his minifterial duty, he foon changed their prejudice into efteem, and their efteem into admiration. During his refidence at Alloa he attracted public notice by the publication of three excellent fermons, "On the Eloquence of the Pulpit;" "On the Method of promoting Edification by Public Inftitutions;" and "On the delufive and bloody Spirit of Popery." But a ftill greater attention was excited by another fermon, "On the Folly, Infamy, and Mifery of unlawful Pleafure," which he preached before the general affembly of the church of Scotland in the year 1760. This difcourfe contains fuch mafterly compofition, with refpect to defcription, fpirit, and elegance, and was delivered with fo much folemnity, animation, and feeling, that it is faid to have filled his learned fathers and brethren with aftonifhment, and juftly raifed him to unrivalled eminence among his clerical contemporaries. It was about this time that the degree of doctor of divinity was conferred upon him by the univerfity of Glafgow; and in a fhort time after, while he was on a vifit at London, he was invited to become copaftor with Dr. Lawrence, to a refpectable congregation of diffenters at Monkwell ftreet. He accepted the offer, and on the death of his colleague, which happened in a few months, he was elected to the fole paftoral office. In this fituation Dr. Fordyce maintained a high fhare of popularity, generally preaching to crowded and overflowing audiences. To this he had a juft claim, as well from the elegance of his compofitions, as from the happy tendency that his difcourfes had to imprefs the heart with the love of virtue and religion. He lived, however, to fee a great declenfion in his popularity, for which many caufes have been affigned, and they all had a fhare in producing it. In the year 1772 a circumftance took place which contributed greatly to thin the pews of his auditory. His brother, a banker of very extenfive bufinefs, was obliged to ftop payment, and his ruin involved the fortunes and property of many of the doctor's conftant hearers and moft liberal fupporters; and though no blame could attach to him on account of his brother's mifconduct, yet

yet the odium which it brought on his family did certainly operate unfavourably on the attachment of several other individuals to him as their minister. Another cause, which led to the decline of Dr. Fordyce's congregation, was a dispute which took place between the doctor and Mr. Toller, his colleague: a number of persons conceiving the latter to be much injured, withdrew with him to another place of worship. This was in the year 1775, but Dr. Fordyce discharged the duties at Monkwell-street till about Christmas 1782, when he discontinued his public services. In the following year he delivered "A Charge" at the ordination of his worthy and excellent successor Mr., now Dr. Lindsay, which has been regarded as the finest specimen of pulpit oratory which he had ever exhibited, and which certainly merits the attentive perusal of every clergyman. He spent the remainder of his life chiefly in Hampshire, in the vicinity of the earl of Bute, with whom he lived in great intimacy, and to whose valuable library he had constant access. Towards the close of life he went to Bath, where he died October 1st, 1796, in the 76th year of his age. The doctor's writings discover much genius and imagination, a correct taste, extensive knowledge of the world, and a happy method of engaging the attention; ardent piety, and a zeal for the interests of genuine virtue. His religious sentiments were manly and rational; in private life he was highly amiable, and justly beloved by all who knew him. Besides the pieces already noticed, he was the author of "Sermons to Young Women," in two volumes, which have been very generally read; "A Sermon on the Character and Conduct of the Female Sex;" "Addresses to Young Men;" "Addresses to the Deity;" a volume of "Poems;" and a "Discourse on Pain." Ency. Brit. Dr. Lindsay's Funeral Sermon for Dr. Fordyce.

FORDYCE, *Sir* WILLIAM, knight, a physician of eminence, was the son, (and one of 20 children,) of Provost Fordyce of Aberdeen, where he was born in the year 1724. He received his education at the Marischal college of that place. At the age of eighteen he had finished his academic studies, and had distinguished himself by his proficiency in Greek and mathematics, besides acquiring a competent knowledge of physic and surgery, under the ablest medical practitioner of Aberdeen. Thus prepared, he joined the army as a volunteer, and afterwards served as surgeon to the brigade of guards on the coast of France, and in the German wars. The warm support of his military friends co-operated with his own merit in early recommending him to extensive practice in London; and he was sent for to greater distances and received larger sums in remuneration, than almost any physician of his time. He went to Switzerland, to Italy twice, to Scotland twice, and to other distant countries, to visit some of his noble and wealthy patients. The wealth, which thus poured in upon him, he most liberally distributed in acts of friendship and bounty. Although he suffered severely from the bankruptcy of his brother, Alexander Fordyce, a banker, he afterwards became bound for him, to the extent of ten thousand pounds, in the project of a manufacture, which totally failed. And here we must not not omit a circumstance, which equally redounds to the credit of sir William, and of the gentlemen concerned. Sir William was called upon to pay this sum in an hour, or go to gaol: when Mr. George Crawford, of Hertfordshire, and Messrs. Drummond, generously discharged the debt, without requiring any other security than their confidence in sir William's professional merit, and in the determined integrity of his character. Yet, notwithstanding these severe shocks to his fortune, he continued to maintain several poor families, and his generosity to his relations was unbounded. His brother, the clergyman, author of the elegant and instructive sermons to young women, had lost several thousand pounds by the banker's failure. Sir William immediately indemnified him to the full amount of his loss. He wrote a treatise "on Fevers," and "on the Ulcerated Sore Throat," which contributed to extend his fame on his entering into practice: he likewise published "a treatise on the Venereal Disease." He suffered a long and severe illness, which terminated his life, on the fourth of December 1792, at his house, in Brook-street, Grosvenor-square. See Gent. Mag. part ii. for 1792.

FORDYCE, GEORGE, an eminent physician, was born at Aberdeen, on the 18th of Nov. 1736; after the death of his father, Mr. George Fordyce, who was proprietor of a small landed estate, called Broadford, in the neighbourhood of that city. He was the only child of his parents, and, his mother having after no long time married again, he was taken from her, when about two years old, and sent to Fouran, where he received his school education. Thence he was removed to the university of Aberdeen, where he took the degree of Master of Arts, when only fourteen years of age. Having very early formed a disposition to the study of medicine, (which he used to attribute partly to the delight he had taken, in his childhood, in looking at the phials of coloured liquors in the windows of an apothecary's shop; and partly to his acquaintance with the learned Dr. Alexander Garden, then an apprentice to an apothecary in Aberdeen;) he was sent, when about 15 years old, to his uncle, Dr. John Fordyce, who at that time practised medicine at Uppingham, in Northamptonshire. With him he remained several years, and then went to the university of Edinburgh, where, after a residence of three years, he obtained the degree of M. D. in October, 1758; having defended a thesis on catarrh. While he resided at Edinburgh, Dr. Cullen was so much pleased with his diligence and ingenuity, that, besides shewing him many other marks of regard, he frequently gave him private assistance in his studies; of which kindness the pupil was ever grateful, and was accustomed to speak of his preceptor in terms of the highest respect. About the end of the year 1758, he came to London; but soon afterwards went to Leyden, chiefly for the purpose of studying anatomy, under Albinus. He returned to London in 1759, where he determined to fix himself as a teacher and practitioner of medicine; a determination, which was greatly disapproved of by his relations, as the whole of his patrimony had been expended upon his education. Inspired, however, with a confidence, which frequently attends the conscious possession of talents, he persisted in his purpose, and, before the end of 1759, commenced a course of lectures on chemistry: this was attended by nine pupils. In 1764 he began to lecture also upon the materia medica, and the practice of physic; and he continued to teach these three subjects for nearly thirty years, giving, for the most part, three courses of lectures on each of them every year; a course which consisted of six lectures in the week of nearly an hour on each subject, lasting nearly four months. The time occupied by these lectures was from about seven o'clock in the morning till ten. In 1765 Dr. Fordyce was admitted a licentiate of the College of Physicians; and in 1770 he was chosen physician to St. Thomas's hospital, after a considerable contest with Dr., afterwards sir William Watson, whom he overcame by a majority of three, having 109 votes against 106. In 1774 he became a member of the Literary Club; in 1776 he was elected a fellow of the Royal Society; and in 1787

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he was admitted, *speciali gratia*, a fellow of the College of Physicians. This circumstance evinces the high opinion of his abilities entertained by his professional brethren: for as he had been particularly active in the dispute, which had existed about twenty years before, between the fellows and licentiates, it was supposed that he had forfeited all title to be admitted into the fellowship through favour. But it is believed that the college, being at this time engaged in preparing a new edition of their "Pharmacopœia," wisely suppressed their resentment, in order to obtain the assistance of Dr. Fordyce in the prosecution of this work, there being confessedly none of their own number so well acquainted with pharmaceutical chemistry as himself. In 1793 he assisted in forming a small society of physicians and surgeons, which has since published two useful volumes under the title of "Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge;" and he continued to attend its meetings most punctually, until within a month or two of his death, which took place at his house in Essex-street, in the Strand, on the 25th of May, 1802.

His countenance was full and heavy, and not expressive of his powers of mind; and his manners were less refined, and his dress, in general, less studied, than is usually regarded, as becoming the physician in this country. From these causes, and from his spending a short time with his patients, although sufficient to enable him to form a just opinion of their disorders, he had for many years but little private employment in his profession; and never, even in the latter part of his life, when his reputation was at its height, enjoyed nearly so much as many of his cotemporaries. This may have partly resulted too, from his fondness for the pleasures of society, to which he often sacrificed the hours that should have been dedicated to sleep; he has frequently indeed been known, in his younger days, to lecture for three hours in a morning, without having undressed himself the preceding night. The vigour of his constitution enabled him to sustain for a considerable time, without apparent injury, this debilitating mode of life: but at length he was attacked with the gout, which afterwards became irregular, and for many years frequently affected him with excruciating pains in his stomach and bowels: in the latter part of his life, also, his feet and ankles were almost constantly swollen, and a little time before his death he had symptoms of water in the chest. To the first mentioned disease (gout), he uniformly attributed his situation, which, for several weeks previous to his dissolution, he knew to be hopeless.

Dr. G. Fordyce possessed a remarkably accurate and retentive memory, in which he placed such great confidence, that he gave all his lectures without notes, and it is not known that he ever had any; nor did he make any memorandum in writing of the engagements, whether of business or pleasure, which he formed; yet he was always most punctual in observing them. Even when he composed his works for publication, his materials were altogether drawn from stores in his memory, which had often been laid up there many years before. This, while it enables us to account for the extraordinary extent of his information in the sciences, either immediately or remotely connected with medicine, also affords an explanation of his great deficiency in the art of literary composition and of the great want of arrangement, by which his writings are disfigured. His style is commonly inelegant, and often involved, inaccurate, and obscure: he frequently not only offends against the common rules of syntax, but errs even in respect to orthography; and his want of method led him to frequent repetitions. These faults might, perhaps, have been avoided, had a less perfect memory led him, from his early years, to commit to writing the information which he wished to preserve.

Dr. Fordyce was the author of several publications, both on medical and philosophical subjects. 1. "Elements of the Practice of Physic." This was used as a textbook for a part of his course of lectures on that subject, and was published in two parts, in 1768 and 1770, in 4to. 2. "Elements of Agriculture and Vegetation." He had given a course of lectures on this subject to some young men of rank, soon after the close of which, one of his hearers, the late Mr. Stewart Mackenzie, presented him with a copy of them from notes which he had taken. Dr. Fordyce corrected the copy, and afterwards published it in 1771, in 4to. 3. "A Treatise on the Digestion of Food," 8vo. 1791; which was originally read before the College of Physicians as the Gulstonian lecture. 4. But the work on which he employed the most labour, was a series of "Dissertations on Fever," of which four were published during his life, and one left in manuscript, which has since been printed. His other writings consist of papers, which appeared in the Philosophical Transactions of the Royal Society, and in the Transactions of the Society for the Improvement of Medical and Chirurgical Knowledge, upon the following subjects. In the former are eight papers: 1. On the Light produced by Inflammation. 2. Examination of various Ores in the Museum of Dr. W. Hunter. 3. A new Method of assaying Copper-ores. 4. An Account of some Experiments on the Loss of Weight in Bodies on being melted or heated. 5. An Account of an Experiment on Heat. 6. The Croonian Lecture on Muscular Motion. 7. On the Cause of the additional Weight which Metals acquire on being calcined. 8. Account of a new Pendulum, being the Bakerian Lecture. His three papers in the Transactions of the last-mentioned society, are. 1. Observations on the Small-Pox, and on the Causes of Fever. 2. An attempt to improve the evidence of Medicine. 3. Some Observations on the Composition of Medicines. He was besides the projector of the experiments in heated rooms; an account of which was given to the Royal Society by sir Charles Blagden; and he was the author of many improvements in various arts connected with chemistry, on which he was frequently consulted by manufacturers. See Gent. Mag. for June, 1802.

FORE, or Fowre, in *Geography*, a small market-town, or, as Dr. Beaufort calls it, a miserable village of the county of Westmeath, Ireland, near Lough Lene; formerly of so much importance as to give name to a barony, and return two members to parliament. The name is said to signify "the town of books;" and it is supposed to have been formerly a seat of literature. It has at present the ruins of several religious buildings. It is 2 miles from Castle-Pollard, and about 71 N.W. from Dublin.

Fore, applied to a *Ship*, denotes all that part of a ship's frame and machinery which lies near the stem.

Fore *and aft*, is used for the whole ship's length, or from end to end.

Fore *Bowline* is the bowline of the fore-sail.

Fore-*Castle of a Ship*, is a short deck placed in the fore part of the ship, above the upper deck.

It is usually terminated, both before and behind, by a breast-work in vessels of war; the foremost end forming the top of the beak-head, and the hind-part reaching to the after-part of the fore-chains.

Fore-*Cat-harpings*, are those that are used to brace in the upper part of the fore-shrouds. See Cat-*harpings*.

FORE-

FORE-BAY *of a Lock*, on canals, is the breaſt or front wall. Caledonian Reports, 1806, p. 12.

FORECLOSED, in our *Ancient Law Books*, ſignifies barred, ſhut out, or excluded for ever; as, when the equity of redemption on mortgages is barred. See EQUITY *of Redemption*, and MORTGAGE.

FOREFANG, or FOREFENG, in our *Old Writers*, is the taking of proviſion from any one in fairs or markets, before the king's purveyors are ſerved with neceſſaries for him. The word is Saxon, compounded of *fore, ante*, and *fangen, prendere*.

FOREFIELD, in *Mining*, ſignifies the face or further part of the work from the mouth or drawing-ſhaft of a mine. Sometimes this is called the ſtool or bank.

FORE-FLANK, the name of a point in cattle ſtock.

FORE-FOOT, in the *Sea-Language*, is when one veſſel ſails or lies acroſs another's way.

As if two ſhips being under ſail, and in ken of one another, one of them lies in a courſe, with her ſtern ſo much weather of the other, that if both hold on, the windward ſhip will run a-head of the other: ſuch ſhip is ſaid to lie with the other's fore-foot.

Though, as ſoon as ſhe has paſſed, they ſay, ſhe is gone out a-head.

FORE-FOOT *of a Ship*, is a piece of timber that terminates the keel at the fore end. It is connected by a ſcarf to the extremity of the keel, of which it makes a part; and the other end of it, which is bent upwards into a kind of knee or crotch, is faſtened to the lower end of the ſtem, of which it makes a part, being alſo called the gripe.

FOREGAVEL, FORGABULUM, in our *Old Writers*, is uſed for a ſmall reſerved rent in money, or quit-rent.

FOREGOERS. The king's ſurveyors were thus called from their *going before*, to provide for his houſehold. 36 Edw. III 5.

FORE-HAND, a term which, in reſpect to the horſe, ſignifies that part which is before the rider. Thus a horſe is often ſaid to have a good or bad fore-hand.

FORE-HAND *Rent*, in *Rural Economy*, is ſuch as is paid before entering upon, or deriving profit from a farm, or any thing held in tenure.

FOREHEAD, a point in the horſe, which ſignifies the front part of the head. The well-ſhaped forehead ſhould be ſomewhat broad, and rather flat: if with a feather and ſtar in it, it is the more complete.

FOREHEAD, *Wounds of*. See WOUNDS.

FORE-HOOKS *of a Ship*. See BREAST-*Hooks*.

FORE-JEERS. See JEERS.

FORE-JEER-*Bits*, in a *Ship*. See BITS.

FOREIGN, ſomething extraneous, or that comes from abroad.

The word is formed from the Latin *fores*, doors; or *foris*, out of doors; or *forum*, market, &c.

Foreign miniſter, foreign prince, foreign goods, &c. are thoſe belonging to other nations. See MINISTER, &c.

Foreign to the purpoſe, ſignifies a thing remote or impertinent.

Foreign plants are particularly called exotics. Foreign foſſils, ſee FOSSIL. Foreign motion, ſee MOTION. Foreign canons, ſee CANON.

In ſome univerſities they give the appellation foreign doctors, *doctores forenſes*, to ſuch as do not reſide in the place, or the univerſity; but take degrees to go and live elſewhere, and in other countries.

In the life of St. Paul, biſhop of Verdun, written by an anonymous author, and publiſhed from a MS. about four hundred years old, by Bollandus, we meet with *forenſis preſbyter*, for a prieſt who lives in another part. The ſame Bollandus notes, that St. Ambroſe uſes the word *forenſis* for exterior.

FOREIGN is uſed, in *Law*, in ſeveral ſenſes, and joined with divers ſubſtantives. Thus,

FOREIGN *Anſwer*, is ſuch an anſwer as is not triable in the county where it is made.

FOREIGN *Attachment*. See ATTACHMENT.

FOREIGN *Bill of Exchange*. See BILL.

FOREIGN *Matter*, is matter triable in another county; or matter done in another county. See INDICTMENT.

FOREIGN *Oppoſer*, or *Appoſer*, is an officer in the exchequer, to whom all ſheriffs or bailiffs do repair to be appoſed by him of their green wax, after they are appoſed of their ſums out of the pipe-office; and who from thence draws down a charge upon one of them to the clerk of the pipe.

His buſineſs is to examine the ſheriff's eſtreats with the record, to aſk the ſheriff what he ſays to every particular ſum therein.

FOREIGN *Plea*, is a refuſal of the judge as incompetent, becauſe the matter in hand was not within his precinct.

FOREIGN *Seamen*, ſerving two years on board Britiſh ſhips, whether of war, trade, or privateers, during the time of war, ſhall be deemed natural born ſubjects. But the perſons ſo naturalized are not capable of being of the privy council, or members of parliament, or of taking any place of truſt, civil or military, or to have any grant from the crown of lands. Stat. 13 Geo. II. cap. 3. ſect. 2.

FOREIGN *Service*, is ſuch ſervice whereby a meſne lord holdeth of another, without the compaſs of his own fee: or that which a tenant performeth, either to his own lord or to the lord paramount, out of his own fee. Kitch. 299. Bract. l. ii. c. 16.

FOREIGN *Service* is alſo uſed to denote military ſervice performed to foreign ſtates. The ſtat. 3 Jac. I. cap. 4. makes it felony for any perſon to go out of the realm to ſerve any foreign prince or ſtate, without having firſt taken the oath of allegiance before his departure; and it is alſo felony for any gentleman, or perſon of higher degree, or who hath borne any office in the army, to go out of the realm to ſerve ſuch foreign prince or ſtate, without previouſly entering into a bond with two ſureties, not to be reconciled to the ſee of Rome, or enter into any conſpiracy againſt his natural ſovereign. And by ſtat. 9 Geo. II. cap. 30. enforced by 29 Geo. II. cap. 17. if any ſubject of Great Britain ſhall enliſt himſelf, or any perſon ſhall procure him to be enliſted, in any foreign ſervice, or detain or embark him for that purpoſe, without licence under the king's ſign-manual, he ſhall be guilty of felony without benefit of clergy; but if the perſon ſo enliſted or enticed, diſcover his ſeducer within fifteen days, ſo that he may be apprehended and convicted of the ſame, he ſhall be indemnified. By ſtat. 29 Geo. II. cap. 17. to ſerve under the French king, as a military officer, is felony without benefit of clergy: and to enter into the Scotch brigade, in the Dutch ſervice, without previouſly taking the oaths of allegiance and abjuration, incurs a forfeiture of five hundred pounds.

FOREIGNERS are the natural born ſubjects of ſome foreign prince. (See ALIEN.) Foreigners reſiding ſeven years in the Britiſh plantations, without any longer abſence than two months at one time, and taking the oaths, are to be deemed natural born ſubjects. But, excepting Quakers and Jews, all other perſons muſt receive the ſacrament in ſome proteſtant or reformed congregation in Great Britain,

or

or the colonies; a certificate whereof must be produced at the time of taking the oaths. 13 Geo. II. cap. 7. sect. 2. See NATURALIZATION.

FOREIRO, FRANCIS, in *Biography*, a native of Lisbon, who flourished in the sixteenth century, was patronized by John III. king of Portugal, who sent him to study at the university of Paris. Here he became a perfect master of the dead languages; and on his return home, in 1540, he undertook the education of Anthony, prior of Crato, and became the most celebrated preacher in Portugal. In the year 1561, the monarch sent him as a divine to the council of Trent, where he acquired the admiration of the assembled fathers by his excellent pulpit talents. He also recommended himself to their respect by the capacity which he discovered for business; and which induced them to entrust to his management different confidential negociations with the pope. Foreiro was afterwards one of three divines, selected by the council of Trent to draw up their catechism, which was published in the year 1566. He was likewise employed by them to reform the missal and Roman breviary. The king, however, commanded him to return to Portugal, which prevented him from accomplishing the latter undertaking. He had not long been home before he was appointed prior of Lisbon; and in the year 1568, he was chosen provincial of his order. When the term of the last office was expired, he withdrew from public life to the convent of Almada, which he had built; and here he died in the year 1587. His works are a Latin version of the prophecy of Isaiah, with a commentary; which was first printed at Venice, then at Antwerp, and afterwards inserted in the fifth volume of the "Critici Sacri," published at London in the year 1660. He wrote commentaries, likewise, on the books of Job and the Psalms, which are lost. Moreri.

FOREJUDGED *the Court*, in *Law*, is when an officer or attorney of any court is banished, or expelled the same, for some offence; or for not appearing to an action on a bill filed against him; in which latter case, he is not to be admitted to officiate, till he appear to the bill. Anno 2 Hen. IV. cap. 8.

He shall lose his office, and be forejudged the court, &c. "Forejudicare, interdum est male judicare." Spel. See ATTORNEY.

FOREJUDGER signifies a judgment, whereby a man is deprived, or put by a thing in question.

FORE-KNIGHT, in the *Sea-Language*, a piece of wood, carved in figure of a man's head, and fast bolted to the beams upon the second deck.

FORE-LAND, in *Embanking*, is the space or land left between the embankment of a river or marsh and the stream or tide-way.

FORE-LAND, in *Fortification*, is a small space of ground between the wall of a place and the moat; called also *berme*, and *liziere*.

FORELAND, or *Forenefs*, in *Geography*, a point of land jutting out into the sea.

FORELAND, *North*, a promontory of England, on the N.E. extremity of the coast of Kent, on which a sea-mark has been erected by the corporation of the Trinity-house, in which lights are exhibited every night; 3 miles N. of Ramsgate. N. lat. 51° 23'. E. long. 1° 17'.

FORELAND, *South*, a cape of England, on the E. coast of the county of Kent, between Dover and Deal, with a light-house. N. lat. 51° 8'. E. long. 1° 22'.

FORELAND, *East*, a cape on the W. coast of North America, on the east side of Cook's inlet. N. lat. 60° 43'. E. long. 209° 19'.

FORELAND, *North*, a cape on the W. coast of North America, and west side of Cook's inlet, where the Russians have a factory, with one large house, about 50 feet long and 24 wide, inhabited by about 19 Russians. N. lat. 61° 4'. E. long. 209° 34'.

FORELAND, *South*, a cape on the W. coast of North America, in Cook's river. N. lat. 60° 50'. W. long. 151° 20'.—Also, a cape in Upper Canada, formerly called Point Palé, on the north shore of lake Erie, opposite to Landguard. On either side of the point there is good anchorage for vessels. Near its extremity on the east side is a pond, where boats may be secure from most winds.

FORELAND, *West*, a cape on the W. coast of North America, on the west side of Cook's inlet. N. lat. 60° 42'. E. long. 209°.

FORE-LEGS, those situated on the fore part of the chest, which should be straight, and well formed in the joints.

FORELLA, in *Ichthyology*, a name given by Figulus and others to the trout.

FORELOCKS, in a *Ship*, are little flat wedges, like pieces of iron, used at the ends of bolts, to keep them from flying out of the holes.

FORELOIN, among *Hunters*, is when a hound going before the rest of the cry, meets chace, and goes away with it.

FORELOIN, a term denoting a point in cattle. See CATTLE, and LIVE STOCK.

FORE-MAST *of a Ship*, is a round large piece of timber, seated in her fore part, on which is borne the fore-sail, and fore-top-sail yard. See MAST.

FORE-MAST *Men*, in a *Man of War*, those on board that take in the top-sails, sling the yards, furl the sails, browse, trise, and take their turn at the helm, &c.

FORENSIC SERVICE. See SERVICE and FOREIGN.

FORENSIS TOGA. See TOGA.

FORENZA, in *Geography*, a town of Naples, in Basilicata; 8 miles S. of Venosa.

FORE-RAKE, in *Sea Language*. See RAKE.

FORE-REACH. The seamen say one ship fore-reaches upon another, when both sailing together, she sails better, or outgoes the other.

FORE-SAIL, the sail of the fore-mast. See SAIL.

FORESCHOKE, DERELICTUM, anciently signified as much as *forsaken* in modern language.

It is especially used in one of our statutes for land or tenements seized by the lord, for want of services due from the tenant; and so quietly held and possessed beyond a year and a day.

As if we should say, that the tenant, who seeing his lands and tenements taken into the lord's hand, and possessed so long, takes not the course appointed by law to recover them, does, in due presumption of law, disavow or forsake all the right he has to them. In which case such lands shall be called foreschoke, says the stat. 10 Ed. II. cap. 1.

FORESHORTENING, in *Painting*, is the art of conveying to the mind the impression of the entire length of an object, when it is represented as viewed in an oblique or receding position; in which case, the actual vision of it is shortened in line on the receding side; *e. g.* a stick held with the end towards the observer appears shortened to the view, and that in a degree according to the angle under which its lengthened side is seen; the art of painting requires, that though thus presented, it should have in its representation the appearance of possessing its utmost extent. Such a view of

of an object is called a foreshortened view; and the representation, foreshortening it.

Without a previous knowledge of the forms of bodies, no foreshortening, however well wrought, would produce the full effect desired. Of this, the world in general are not aware, and when a foreshortened view of an object is given, are apt to exclaim against its appearance as being shorter than nature; not recollecting, or never having observed, how much they are assisted in the view of the real object by some slight motion either of it or of themselves; and thus they frequently, without mercy, criticise works of art in this respect, when their own presumption is the only thing blameable. The writer of this article, with much difficulty, persuaded the late lord Thurlow, the acuteness of whose judgment is every where acknowledged, of the truth of this remark. His lordship would not be dissuaded from the idea, that the forms of natural objects were at all times, when visible, completely to be understood. He was convinced, only by being requested to decide the length of a stick which he had not previously seen, and which was then held with the end nearly direct before him; this he was unable to do, and of course confirmed the opinion he had opposed.

Foreshortening constitutes the difficulty of designing or drawing. The forms of bodies, wherein lines are presented direct before the view, as in square-sided ones seen immediately in front, are very easily imitated: but when those composed of intricate lines are thrown into oblique positions, where every line varies in appearance from its real shape, yet the whole together gives the just idea of the body; then is the skill of the great artist required to represent it faithfully; and none but the most cultivated talent is equal to the task.

In the foreshortening of straight-sided objects, the rules of perspective, when aided by light and shade, will fully produce the effect; and indeed the recollection of them is at all times useful when foreshortened views are selected for imitation: but the variations of rounded objects, and especially if composed of many parts, are too numerous and complicated to be submitted to the regulations of that science; reason, and the eye alone, must then be the guides; as in the face and limbs of the human figure, which are constantly presenting themselves under foreshortened views.

That would be of necessity a very stiff action of the figure indeed, in which some part or other was not affected by this peculiarity; a leg, or an arm, the neck, or some feature of the face. The mere receding of the trunk and limbs in their rounding is in fact a foreshortening, in the most direct front view; and it requires great delicacy of the eye and hand to adjust the due proportions of the parts as they retire from the view: and to give the appearance of their real quantity where a much smaller one is actually seen; that is, occupies upon the retina of the eye a much smaller space (owing to the obliquity of the view) than they would do if seen directly in front.

The variations that take place in the forms of bodies, as they are more or less foreshortened, are perfectly astonishing to those who are not accustomed to observe them. A lengthened object becomes square, or almost a point; a round one, oval; and irregular ones take every form in turn; so that the skilful artist has by its means, when judiciously employed, the power of introducing figures according to his necessities, to fill his canvas, and complete the forms of his groups in whatever shape he pleases, without distortion of the limbs.

But when grace or beauty is required in drawings or paintings of the human figure, these foreshortenings should be sparingly employed; for even when perfectly effected, they are still apt to convey the impression of bad proportion, and often produce unpleasant forms.

The actual effect which takes place in foreshortened views of objects that have projecting parts, is, that those which are most in advance, by their projection, hide others that are behind them, and in immediate connection with them; and it is this loss of parts which shortens the view; *e. g.* a horse seen directly in front, is foreshortened to the eye. The head projecting hides the neck, and the belly the hinder parts in some measure; yet, though those parts are lost to the view, by a previous knowledge of the form of the animal, and the turns of the lines that are seen indicating some intermediate form between those presented to the eye, the mind is at no loss for the conception of its entire shape.

From this it is evident that the rules of proportion are but partially useful in foreshortening, and therefore in drawing objects, thus presented to the view, their visible proportions must be copied, rather than those proper and natural to them. For the eye and the understanding, being directed by the art of perspective, ought to be the guide and measure in these kinds of effects.

Though this peculiar part of the art of drawing be constantly required by the painter more or less in all his works, it has been most principally exercised by those who have been employed in painting cielings or domes; where the intention has frequently been, to make the whole of the objects of the picture foreshortened, or appear, as the Italians term it, *sotto in su* (as seen from below). Such is the case in great measure in the cieling of the banquetting room, now the chapel at Whitehall, painted by Rubens.

But the great exemplar of it is the dome of the great church at Parma, painted by that divine master Correggio; whose extraordinary talents appear to have revelled with delight in selecting the boldest and most extraordinary foreshortenings of the human figure; in which he has succeeded most surprisingly.

Tintoretto and Paulo Veronese, skilfully employed in adorning the cielings of the halls and chapels, &c. in Venice, chose the *sotto in su*, generally, as the mode of construction for their pictures, and produced numberless astonishing works of this kind; and after them followed in the same way most of the masters of the Venetian school. It suited the style of that school particularly; where freedom of execution, and brilliancy of colouring, produced by strong contrasts of hues, and strong oppositions of light and shadows, were by means of foreshortenings readily brought into the surface of the picture. Sometimes it adds greatly to the grandeur of a figure to have it appear as seen a little from below, lowering the horizon by that means behind the figure; but it may be doubted whether that be owing to the lines produced by the foreshortening, or to the comparatively increased mass of figure against the sky.

FORE-SHROUDS. See Shrouds.

FORESKIN. See Prepuce.

FOREST, Sylva, in *Geography*, a great wood; or a large extent of ground covered with trees.

The word is formed of the Latin, *foresta*, which first occurs in the Capitulars of Charlemagne, and which itself is derived from the German, *forst*, signifying the same thing. Spelman derives it from the Latin *foris restat*, by reason forests are out of towns. Others derive *foresta a feris*, q. d. *feresta, quod sit tuta statio ferarum*, as being a safe station, or abode, for wild beasts.

The Caledonian and Hercynian forests are famous in history. The first was a celebrated retreat of the ancient Picts and

and Scots: the latter anciently poffeffed the greateft part of Europe; particularly Germany, Poland, Hungary, &c. In Cæfar's time it extended from the borders of Alfatia and Switzerland to Tranfylvania, and was computed fixty days journey long, and nine broad: fome parts or cantons thereof are ftill remaining. The foreft of Dean, in Gloucefterfhire, is famous for its iron works. The ancients adored forefts, and imagined a great part of their gods to refide in them: temples were frequently built in the thickeft forefts, the gloom and filence of which naturally infpired fentiments of devotion, and turned men's thoughts within themfelves.

For the like reafon, the ancient Druids made forefts the place of their refidence, and performed their facrifices, inftructed their youth, and gave laws in them. See DRUIDS.

FOREST, in a *Law-fenfe*, is defined a certain territory of woody grounds and fruitful paftures, privileged for wild beafts, and fowls of foreft, chace, and warren, to reft and abide in, under the protection of the king, for his recreation and delight; bounded with unremoveable marks and meres, either known by matter of record or prefcription; replenifhed with wild beafts of venery, or chace, and with great coverts of vert for fuccour of the faid beafts; for prefervation and continuance whereof, with the vert and venifon, there are certain peculiar laws, privileges, and officers.

The properties and characters of a foreft are, firft, that it cannot be in the hands of any but the king; becaufe none elfe had power to conftitute fuch commiffions as are neceffary to the being of a foreft, befide the king; as, particularly, that of juftice in eyre of the foreft.

And yet the abbot of Witby had a foreft by grant of king Henry II. and king John, with all officers incident thereto.

As the king reserved to himfelf the forefts for his own exclufive diverfion, fo he granted out from time to time other tracts of land to his fubjects, under the names of *chaces* or *parks* (which fee), or gave them licences to make fuch in their own grounds; which, indeed, are fmaller forefts, in the hands of a fubject, but not governed by the foreft-laws: and by the common law, no perfon is at liberty to take or kill any beafts of chace, but fuch as hath an ancient chace or park; unlefs they be alfo beafts of prey. (See GAME.) If, however, the king grant a foreft to a fubject, and granteth further, that upon requeft made in chancery, the grantee and his heirs fhall have juftices of the foreft, then the fubject hath a foreft in law. 4 Inft. 314. Cro. Jac. 155.

The fecond character of a foreft is the courts belonging to it, which are the *juftice-feat*, and the *regard*, held every third year; the *fwanimote* or *fwainemote*, held thrice every year; and the *attachment*, once every forty days. See each refpectively.

But the moft effential mark of a foreft is the fwanimote, which is no lefs incident thereto than the court of pyepowder to a fair. If that fail, it ceafes to be a foreft, and commences a chace.

The third characteriftic is the officers belonging to a foreft, for prefervation of the vert and venifon; as the juftices of the foreft, the warden, warder, or keeper, ranger, verderers, forefters, agiftors, regarders, bailiffs, beadles, &c. See each under its proper article, JUSTICE *of the Foreft*, KEEPER, &c.

The beafts of the foreft are the following five, *viz.* the hart, hind, hare, boar, and wolf; the feafons for hunting of which are as follow, *viz.* that of the hart and buck begins at the feaft of St. John Baptift, and ends at Holy-rood day; of the hind and doe begins at Holy-rood, and continues till Candlemas; of the boar, from Chriftmas to Candlemas; of the fox begins at Chriftmas, and continues till Lady-day; of the hare, at Michaelmas, and lafts till Candlemas. Dyer, 169. 4 Inft. 316.

The way of making a foreft is thus: certain commiffioners, appointed under the great feal, view the ground intended, and fence it round; this being reported in chancery, the king caufes it to be proclaimed throughout the county where the land lies, that it is a foreft, and is thenceforth to be governed by the laws of the foreft; and prohibits all perfons from hunting there without his leave.

He then appoints officers for the prefervation of the vert and venifon, and it then becomes a foreft on record. Manwood. c. 2. Although the king may erect a foreft on his own ground and waftes; yet he may not do it on the lands of a fubject, without his confent; and agreement with him for that purpofe ought to be confirmed by parliament. 4 Inft. 300. Proof of a foreft appears by matter of record, as by the eyres of the juftices of the forefts, and other courts, and officers of the forefts, &c.; and not by the name in grants. 12 Rep. 22. As parks are inclofed with wall, paling, or other appropriate fence; fo forefts are inclofed by meres and bounds, fuch as rivers, high-ways, hills; which are an inclofure in law, and without which it cannot be a foreft: and in the eye of the law, "the boundaries of a foreft go round about it, as it were a brick wall, directly in a right line from the one to the other, and they are known either by matter of record, or prefcription." 4 Inft. 317. Bounds of a foreft may be afcertained by commiffion from the lord chancellor; and commiffioners, fheriffs, officers of forefts, &c. are empowered to make inquefts thereof. Stat. 16 & 17 Car. I. c. 16. The boundaries of a foreft are parcel of a foreft; fo that if any perfon kill or hunt any of the king's deer in any high-way, river, or other inclufive limit of a foreft, the offence is the fame as if committed within the foreft. 4 Inft. 318. There are two kinds of boundary: the one inclufive as to jurifdiction, fuch as highways, &c.; the other exclufive in that refpect, as churches, church-yards, mills, houfes, trees, &c. which bound the foreft, but are not within the jurifdiction. Ibid. But a manor, land, wood, &c. within the meres of a foreft, may, by the king's charter, be exempted out of the regard of the foreft. (Manw. 133.) Yet it fhall not be exempted by prefcription; for meres are eftablifhed by the ftat. 6 Edw. I., and there can be no prefcription fince. Jon. 271. By the grant of a foreft, the game of the foreft do pafs.

Forefts are of fo great antiquity in England, (except the New foreft in Hampfhire, erected by William, called the Conqueror, and Hampton-court, erected by king Henry VIII. fee ftat. 31 Hen. VIII. c. 5.) that, it is faid, there are no records in hiftory that mention their origin; though they are noticed by feveral writers, and in divers laws and ftatutes. 4 Inft. 319. The four principal forefts are New, Sherwood, Dean, and Windfor forefts. New Foreft, fo called from its being newly added to the feveral forefts previoufly poffeffed by the crown, was afforefted by William I. (the Conqueror); concerning which hiftory informs us, that it was made by laying wafte a country of above 30 miles in extent, driving out all the inhabitants, deftroying all their dwellings, not fparing even their churches, 22, or as fome fay, 36 of which he demolifhed, much as he affected a refpect for religion. This was one of the moft horrible acts of wanton cruelty recorded in hiftory, if it was done for his pleafure only; and there is no warrant in any ancient

ancient author for the conjecture of some modern writers, that he did it to facilitate the landing of forces, which he might have occasion to bring over from Normandy, by thus disabling the English from collecting together, or maintaining any on that coast. If this were his motive, and not the contiguity of the New forest to his palace at Winchester, it was the policy of a barbarous tyrant, not of a wise or good king. M. Voltaire, in his "Abridgment of Universal History," has questioned this fact. But lord Lyttelton has alleged various proofs from Florence of Worcester, William of Malmsbury, and other writers of the best authority in the times when they lived, which attest and establish it. (Hist. Hen. II. vol. i. p. 380.) The chief officer of this forest is the lord warden: and under him are two distinct appointments of officers; the one to preserve the *venison* of the forest, and the other to preserve its *vert*: the former term, in the language of forest-law, comprehending every species of game; and the latter signifying every thing that bears a green leaf within a forest that may cover a deer, but especially great and thick coverts. The office of superintending the game is now delegated to 15 keepers, who preside over the same number of walks, into which the forest is divided. The woods are under the superintendence of the woodward, under whom are 12 regarders. Besides these officers, who are appointed by the lord warden, there are four others called verderers, who are commonly gentlemen of property and interest in the neighbourhood, and are elected, like knights of the shire, by the freeholders of the county. These officers are the only judges of the forest courts. There is another officer of late constitution, called the purveyor, and appointed by the commissioner of the dock-yard at Portsmouth, whose business it is to assign timber for the use of the navy.

The forest of Sherwood, so renowned in story as the scene of the exploits ascribed to Robin Hood, is a royal demesne, and since the reign of Edward I. it has been always granted by the sovereign to some of the nobility and gentry, as a mark of special favour. It is governed by a warden, his lieutenant, and a steward, a bow-bearer, and a ranger, four verderers, twelve regarders, four agistors, and twelve keepers in the main forest, under the chief forester, who holds it in fee, with liberty to destroy and kill at pleasure, reserving 100 deer in the whole walk. There are also, as members of the forest, several woodwards for every township within the forest, and one for every principal wood.

Dean forest is now thinned by frequency of felling, and narrowed by increase of cultivation, though a few solitary deer still continue to run wild in its recesses.

Windsor forest is plentifully stocked with deer and game of every description: it was appropriated to hunting, and the preservation of royal game, by William the Conqueror; and the laws and regulations established by him for that purpose are, in most respects, still observed.

In England there are 69 forests, 13 chaces, and upwards of 750 parks.

The whole island was replenished with all sorts of game in the times of the Britons; they lived in a wild and pastoral manner, without inclosing or improving their grounds, and derived much of their subsistence from the chace, which they all enjoyed in common. But when husbandry took place under the Saxon government, and lands began to be cultivated, improved, and inclosed, the beasts naturally fled into the woody and desart tracts, which were called the forests; and, having never been disposed of in the first distribution of lands, were therefore held to belong to the crown. These were filled with great plenty of game, which our royal sportsmen reserved for their own diversion, on pain of a pecuniary forfeiture for such as interfered with their sovereign. But every freeholder had the full liberty of sporting upon his own territories, provided that he abstained from the king's forests; as is fully expressed in the laws of Canute (c. 77.) and of Edward the Confessor (c. 36.); and this, indeed, was the ancient law of the Scandinavian continent, from whence Canute probably derived it; but, upon the Norman conquest, a new doctrine took place. Accordingly our ancient Norman kings, upon the principles of the feudal law, that the king is the ultimate proprietor of all the lands in the kingdom, and that therefore he has the right of the universal soil, were the first who inclosed forests, and settled the jurisdiction thereof. In the course of a few reigns from the Conquest, no less than sixty-eight forests were inclosed; the strictest laws were made to secure them, and the severest penalties inflicted on all trespassers upon them.

William the Conqueror decreed the eyes of any person to be pulled out, who took either a buck or boar; William Rufus made the stealing of a doe a hanging matter; the taking of a hare was fined 20*s.* and a coney at 10*s.* Eadmer adds, that fifty persons of fortune, being apprehended by that last prince for killing his bucks, were forced to purge themselves by the fire of ordeal, &c.

Henry I. made no distinction between him who killed a man, and him who killed a buck; and punished those who destroyed the game, though not in the forest, either by forfeiture of their goods, or loss of limbs; though Henry II. remitted it for a temporary imprisonment.

Richard I. revived the old discipline of gelding and pulling out the eyes of those convicted of hunting in the forest: but he afterwards relaxed a little, and was contented to make such convicts abjure the realm, or be committed, or pay a fine. See FOREST-*Law*, infra.

FOREST, *Assize of the.* See ASSIZE.

FOREST, *Charter of the.* See CHARTER *of the Forest*.

FOREST, *Drift of the.* See DRIFT.

FOREST, *Foot of the.* See FOOT.

FOREST, *Keeper of the.* See KEEPER.

FOREST, *Perambulation of the.* See PERAMBULATION.

FOREST, *Purlieu of a.* See PURLIEU.

FOREST, *Reposition of the.* See REPOSITION.

FOREST, *Waste of the.* See WASTE.

FOREST is also used adjectively. The forest cities of the empire are four cities situate in the ancient Black forest, or Sylva Nigra, a part of the ancient Hercynian forest, *viz.* Rheinfield, Waldshut, Seckingen, Lauffenbourg. But now, since the bounds of the Black forest are contracted, these cities are out of the limits thereof.

FOREST, *Black.* See BLACK *Forest*.

FOREST-*Law.* The forest-laws are peculiar laws, different from the common law of England.

Before the making of Charta de Foresta, in the time of king John and his son Henry III., confirmed in parliament by 9 Hen. III. offences committed therein were punished at the pleasure of the king in the severest manner. By this charter many forests were disafforested and stripped of their oppressive privileges, and regulations were made for the government of those that remained; particularly, killing the king's deer was made no longer a capital offence, but only punished by fine, imprisonment, or abjuration of the realm; yet even in the charter there were some grievous articles, which the clemency of later princes have since by statute thought fit to alter *per assisas forestæ*.

And to this day, in trespasses relating to the forest, *voluntas reputabitur pro facto*; so that if a man be taken hunting a deer, he may be arrested, as if he had taken a deer. The

The forester may take and arrest a man, if he be taken either at dog-draw, stable-stand, back-bear, or bloody-hand, notwithstanding that three of these be only presumptions. See DOG-*Draw*, STABLE-*Stand*, &c. See also BLACK *Act*, DEER-*Stealing*, GAME, &c.

FOREST, a small island in the British territories, at the mouth of lake Ontario, between which and Grand island is a narrow channel. It lies nine miles southerly of fort Frontinac, and six N. westerly of Roebuck island, in the same lake, and within the line of the United States.

FORESTS, or *Forêts*, *Department of*, one of the thirteen departments of the region of France, called the reunited country, and comprehending a part of the duchies of Luxembourg and of Bouillon, bounded on the east by Sarre, and on the south by Moselle, in N. lat. 49° 55′. The territorial extent of this department is 7,080 kiliometres, or about 340 square leagues, and it contains 225,549 inhabitants, in four districts, *viz.* Neufchateau, Luxembourg, Bittbourg, and Dieckirch; 28 cantons, and 383 communes. Its contributions to general purposes amount to 1,340,663 francs, and the charges upon it for administration, justice, and public instruction, are 215,623 fr. 66 c. This department is hilly, wooded, indifferently fertile, and abounding in mines.

FORESTS, *Submerged*, in *Natural History*, constitute a curious and important phenomenon, which most writers on the fens of the eastern coast of England have noticed: it being common in such districts to find prostrate forests of trees under many feet of solid peat and silt, and even the tools, in some instances, which man, in the early periods of the history of this island, has employed in felling and converting them to his use; and this, in situations at present much below the high water level of every tide of the sea, and scarcely elevated above low water level, in many instances, where no species of tree or plant of the kinds now found will grow, owing to the salt water, as observed under ENCROACHMENT *of the Sea*. In the Phil. Trans. 1799, part i. p. 145, Dr. Correa de Serra's survey of a submarine forest on the east coast is given, and similar submersions are observable on the flat shores of almost every maritime county of the British island: such seem strongly to point to one of two conclusions, *viz.* that the island has either subsided some feet into the bosom of the ocean within the last eight or ten centuries, or that the sea has risen as much within the same period, which latter phenomenon must have been observed on the opposite continent, in Denmark, France, and Spain, as well as the Netherlands, if it had occurred.

FOREST *Trees*, in *Gardening*, is a common name for all such trees as are grown in large woods and forests, either for the purpose of timber, or other uses. Most of the deciduous trees are of this kind, and the term may be applied with propriety to many of the evergreen sorts, as they are frequently introduced into large forest plantations. There are many different kinds of these trees; but those chiefly raised as timber are oak, ash, elm, beech, chesnut, maple, birch, lime, alder, poplar, larch, fir, pine, &c.

The methods of raising forest-trees are different according to the several kinds, but principally by seeds, layers, and cuttings, as shewn under their different heads.

In the raising of plantations of forest-trees, either by sowing the seeds of them, or setting the young plants after they have attained some growth, care should constantly be taken to adapt the sorts of the trees as much as possible to the state and nature of the soil, as well as to the situation and exposure of the land. In this way they succeed with much greater certainty and success.

It is found by experience that the oak, elm, maple, birch, &c. succeed best on such soils as are of the more deep and heavy kinds; while the ash, beech, chesnut, larch, fir, pine, &c. thrive the most perfectly in such soils as are of the more light, dry, and friable descriptions; and the alder, poplar, willow, &c. where the moisture is more considerable.

The proper management of forest-trees is a matter which requires much care and attention. They demand, in both thinning out and pruning their branches, the greatest nicety and attention to the different circumstances of the cases. Where the climate is severe, and the exposure considerable, much less thinning and pruning will be requisite than under the contrary circumstances. And in the latter operation, the nature and habits of growth of the trees are likewise to be taken into the account, and well considered, before the work is begun. In the business of thinning out forest-trees, where the situations are bleak and exposed, great regard must also be had to the preservation of such sorts of them, especially near the outsides, as are the most suited to the nursing and sheltering of the others. Scarcely any thinning at all will be required in the more outward circles of forest-woods in such situations. And in all cases the work of thinning should be performed in a gradual manner, so as not to cause too great a cold and exposure at once to the trees.

Evergreen and resinous trees in general stand in need of much less pruning than such as are of the deciduous kind; indeed, till lately they have scarcely been attempted to be pruned at all; and how far the pruning system which has recently been introduced, with respect to them, may be beneficial, is yet to be decided by the results of further trials. It has obviously one great disadvantage, which is that of rendering the trees much less ornamental. It must be a very considerable increase in the growth of the timber of such trees that can compensate for such a deficiency in their ornamental appearance.

The great object of pruning forest-trees is that of augmenting the growth of the wood or timber, by preventing their sap-juice from being too greatly expended on the boughs or branches. But as it is necessary to the healthy growth and increase of such trees that they should possess a sufficient number of such branches, it is easy to perceive that the work of pruning may be carried too far, except this point be properly regarded in the execution of it. Proper pruning only requires that such branches should be removed as are superfluous and unnecessary to the perfect timber growth of the trees. Where length of bole is wanted, the lower boughs should chiefly be trimmed off, thinning out at the same time a few in different parts of the head, which are placed in the most irregular or improper manner. But in cases where the trees have been drawn up to a sufficient length in the boles, the more irregular boughs of their heads need only be gradually thinned out, so as to promote their full growth and increase in wood. The branches should in all cases be cut off as closely and evenly as possible to the trees, and, to prevent the larger ones from splitting and doing injury in that way, they should be cut on the under as well as upper side at the time they are removed or taken off from the trees.

By due attention in the pruning of trees, especially when taken while they are young, their regular and straight growths may be greatly directed and promoted. See PRUNING *Timber Trees*.

All sorts of forest-trees should be well secured from being cropped while young by cattle, as, whenever a branch or shoot is taken off by them, the tree is in great danger of being wholly destroyed. It is the best method to remove such injured shoots as soon as possible, by cutting them away close to the bodies of the trees.

Beech, and some of the soft wooded trees, bear pruning

5 worse

worse than other sorts, which should be kept in mind by the workman employed in the execution of the business.

The most proper season for pruning young trees of the forest kind is from February to the end of the following month, but they are often improperly pruned at other periods. And it should be performed every second or third year, according to the extent of growth, and the sort of tree.

The growth of forest trees is extremely different according to the kind, soil, climate, exposure, and various other circumstances; but, in general, it may be from one inch to two inches in thickness in the boles, in the course of the year. And it is found that the large and small trees increase in this respect pretty much in the same proportion where they are in equally thriving conditions. Mortimer long since, however, found that the state and quality of the soil had much influence in this business; and after stating the common increase in the oak to be about one inch and a quarter in the body in the year, asserts that a large oak, which grew in one of his own ploughed fields, where the earth was tilled and manured every year, and that had often cattle lying under it, that dunged about its roots, grew annually no less than four inches in thickness. This is considered as a great proof of the advantage of digging about the roots of forest-trees and dunging them; and is suggested as a practical method of increasing their growth in many cases. The destruction of the weeds which rise about forest-trees is likewise another method which is proposed for increasing their growth. The shrubby underwood in forests and coppices is, however, considered as highly beneficial in promoting the growth of the trees which they contain. It is probable, however, that the warmth caused by the closeness of such woods may, in some measure, contribute to the effect. See PLANTATION, and PLANTING.

When forest-trees are transplanted, it should be done while they are very young, as only of a few years growth, the ground having been previously well prepared for the purpose of receiving them. The oak, and other tap-rooted trees should perhaps seldom, if ever, be transplanted where they are intended to stand for timber, as by such means these roots are destroyed, and consequently the natural habit of growth in them changed. See TRANSPLANTING *Timber-trees.*

FORE-STAFF, an instrument used at sea, for taking the altitudes of heavenly bodies.

The fore-staff, called also cross-staff, takes its denomination hence, that the observer, in using it, turns his face towards the object, in contradistinction to the back-staff, where he turns his back to the object.

The fore, or cross-staff, represented in *Plate* I. *Navig. fig.* 7. consists of a straight square staff, A B, graduated like a line of tangents, and four crosses or vanes, F F, E E, D D, C C, which slide thereon. The first and shortest of these vanes, F F, is called the ten-cross, or vane, and belongs to that side of the instrument whereon the divisions begin at three degrees and end at ten. The next longer vane, E E, is called the thirty-cross, belonging to that side of the staff wherein the divisions begin at ten degrees, and end at thirty, called the thirty-scale. The next vane, D D, is called the sixty-cross, and belongs to the side where the divisions begin at twenty degrees, and end at sixty. The last and longest, C C, called the ninety-cross, belongs to the side whereon the divisions begin at thirty degrees and end at ninety.

FORE-STAFF, *use of the.* The great use of this instrument is to take the height of the sun and stars, or the distance of two stars; and the ten, thirty, sixty, or ninety crosses, are to be used according as the altitude is greater or lesser; that is, if the altitude be less than ten degrees, the ten-cross is to be used; if above ten, but less than thirty, the thirty-cross is to be used, &c.

Note, For altitudes greater than thirty degrees, this instrument is not so convenient as a quadrant or semi-circle.

FORE-STAFF, *to observe an altitude by the.* Apply the flat end of the staff to your eye, and look at the upper end of the cross for the centre of the sun or star, and at the lower end for the horizon. If you see the sky, instead of the horizon, slide the cross a little nearer the eye; and if you see the sea, instead of the horizon, slide the cross farther from the eye: and thus continue moving, till you see exactly the sun or star's centre by the top of the cross, and the horizon by the bottom thereof.

Then the degrees and minutes, cut by the inner edge of the cross upon the slide of the staff, peculiar to the cross you use, give the altitude of the sun or star.

If it be the meridian altitude you want, continue your observation as long as you find the altitude increase, still moving the cross nearer to the eye.

By subtracting the meridian altitude thus found, from ninety degrees, you will have the zenith distance.

To work accurately, an allowance must be made for the height of the eye above the surface of the sea, *viz.* for one English foot, 1 minute; for five feet, $2\frac{1}{2}$; for ten feet, $3\frac{1}{2}$; for twenty feet, 5; for forty feet, 7, &c.

These minutes, subtracted from the altitude observed, and added to the zenith distance observed, give the true altitude, and zenith distances.

FORE-STAFF. *To observe the distance of two stars, or the moon's distance from a star, by the fore-staff.* Apply the instrument to the eye, and looking to both ends of the cross, move it nearer or farther from the eye, till you see the two stars; the one on the one end, and the other on the other end of the cross; then the degrees and minutes cut by the cross on the side proper to the vane in use, give the star's distance.

FORESTAGE, FORESTAGIUM, in our *Ancient Customs*, an obsolete duty or service, paid by the forester to the king. In Brittany, Lobineau observes, the office of foresters was held by gentlemen of the first rank, who for their forestage were obliged to furnish the lord, when he kept open house, with cups and spoons.

FORESTAGE also seems to have been used for a duty payable to the king's foresters. "Ei sint quieti de thelonio, et passagio, et de forestagio, &c." Chart. Edw. I.

It may likewise be taken for a right to use the forest, or a taking of reasonable estovers.

FORESTAL, or FORSTAL, in Domesday wrote *Foristel*, is an intercepting in the highway; or stopping, or even insulting a passenger therein.

The word is formed of the Saxon *fore*, before, and *stal*, station. In the laws of Henry I. the sense of the word is thus explained: "forestal est, si quis ex transverso incurrat, vel in viam expectet, et assaliet inimicum suum."

FORESTALLER, a person who buys up or forestalls the market of any articles of prime necessity; and who procures them on their way, or in the road to it.

FORESTALLING, the practice of buying up or bargaining largely for such articles as are of the first necessity, as grain, fat cattle, sheep, &c. in the way or passage before they reach the markets or fairs where they are to be sold, with the view of enhancing their prices, in order to re-sell them in the same places to a higher profit. Also the intercepting or procuring them as they come from beyond the seas or otherwise, towards any city, port, haven, or creek

of the kingdom. It has been ftated by Fleta that it fignifies "obftructionem viæ vel impedimentum tranfitus, et fugæ averiorum."

It is a mifchievous practice which has long too much prevailed, and which feems at prefent far from being on the decline near large towns where the confumption is great. It fhould be guarded againft as much as poffible by a more full and complete enforcement of the laws againft it.

By the 5th and 6th of Edw. VI. cap. 14. it is enacted that any buying or contracting for merchandize, victuals, or other things whatfoever, in the way, coming by land or water, to any fair or market, or to any port, &c. to be fold, or caufing the fame to be bought; or diffuading people by word, letter, or meffage, or otherwife, from bringing fuch things to market; or perfuading them to enhance the price after they are brought thither, is foreftalling: and the party guilty of any offence of foreftalling, &c. upon conviction at the quarter feffions by two witneffes, on bill, information, prefentment, &c. fhall for the firft offence lofe the goods fo bought, or the value of them, and fuffer two months imprifonment: for the fecond offence, he fhall forfeit double the value, and be imprifoned fix months; and for the third offence, he fhall lofe all his goods, be fet up in the pillory, and be imprifoned at the king's pleafure.

Several other ftatutes have been made from time to time againft the offences of foreftalling, engroffing, and regrating, all of which, from the 5 & 6 Edw. VI. c. 14. above cited, downwards, and all acts for enforcing the fame, are repealed by ftat. 12 Geo. III. c. 71, from the preamble of which we learn that the remedy was found worfe than the difeafe. But thefe offences againft public trade are highly criminal at common law (1 Hawk. P. C. 234); and are punifhable by difcretionary fine and imprifonment. (Id. 235.) Indeed, fo jealous is the common law of practices of this nature, which are a general inconvenience and prejudice to the people, and peculiarly oppreffive to thofe of the poorer clafs, that it will not fuffer corn to be fold in the fheaf before it is thrafhed; for by fuch fale the market is in effect foreftalled. 3 Inft. 197. H. P. C. 152.

Forestalling is particularly ufed in Crompton, for ftopping a deer broken out of the foreft, and preventing its returning home again; or, a lying between him and the foreft in the way he is to return.

FORESTEAD, in *Mining*, fignifies a fmall and inferior fort of lead ore, obtained by buddling the old hillocks or refufe of former ore-dreffing; it is inferior to *fmytham*, which fee.

FORESTER, a fworn officer of the foreft, appointed by the king's letters patent to walk the foreft, and watch the vert and venifon; as alfo to attach and prefent all trefpaffes againft both, within his bailiwick or walk, to the foreft-courts, to be punifhed according to their offences. He is alfo to take care of the lawing of dogs.

Though the letters patent of a forefter be ordinarily only granted *quamdiu bene fe gefferit*; yet they are granted to fome and their heirs, who are hereby called forefters in fee. 4. Inft. 293. But though this office is a fee fimple, it cannot be granted or affigned over without the king's licence. 4 Inft. 316.

A "riding forefter" is to lead the king in his hunting (1 Jones 277). Although every lord of parliament, fent for by the king, may, both in coming and returning, kill a deer or two in the king's foreft or chace through which he paffes; yet it muft not be done privily, without the view of the forefter, if prefent; or, if abfent, by caufing one to blow a horn; becaufe otherwife he may be a trefpaffer, and feem to fteal the deer. Chart. Foreft. c. 11. 4 Inft. 308. If any forefter find any perfon hunting without warrant he is to arreft his body, and carry him to prifon, from whence he fhall not be delivered without fpecial warrant from the king, or his juftices of the foreft, &c. But by ftat. 1 Ed. III. c. 8. perfons are bailable, if not taken in *the manour*, as with a bow ready to fhoot, carrying away deer killed, or fmeared with blood: though if one be not thus taken, he may be attached by his goods. 4 Inft. 289. A forefter fhall not be queftioned for killing a trefpaffer, who (after the peace cried to him) will not yield himfelf; fo as it be not done out of fome former malice. Stat. 21 Ed. I. ft. 1. But if trefpaffers in a foreft, &c. kill a man who oppofes them, although they bore no malice to the perfon killed, it is murder; becaufe they were upon an unlawful act, and therefore malice is implied. Rol. Abr. 548. And if murder be committed by fuch trefpaffers, all are principals. Kel. 87.

Sir William Temple relates, that the Franks having fubdued all Gaul, their princes reduced Flanders into a kind of government, and gave the quality of forefter, with part of the province, to the braveft of their captains.

This quality of lord forefter held till the time of Charlemagne, or, according to others, of Charles the Bald, in whofe time Flanders being erected into a county, the title of forefter was changed into that of count.

FORESTUS, Petrus, or Peter Van Foreest, in *Biography*, was born at Alcmaer in 1522. He was fent by his father to Louvain, in order to ftudy with a view to the profeffion of the law; which, however, he foon changed, on account of his ftrong inclination to the profeffion of medicine. This fcience he cultivated in the univerfities of Bologna, Padua, and Rome; at the former of which he graduated, and afterwards proceeded to complete his ftudies at Paris. He fettled, at the requeft of his friends, in his native town; but at the end of twelve years removed to Delft, in confequence of a petition from the inhabitants of that place, which was at that time ravaged by a fatal contagious epidemic. Foreeft obeyed the call of humanity, notwithftanding the dangers to which he was neceffarily expofed. But he not only preferved his own health, but was extremely fuccefsful in his adminiftration of remedies to others; infomuch that the town of Delft regarded him as their preferver, and retained him in the capacity of phyfician, with a confiderable penfion, for nearly thirty years; after which he was invited to Leyden, to give the firft lectures on medicine, at the opening of the univerfity in 1575. He afterwards returned to Delft, and refided there about ten years more, when his attachment to his native city impelled him to vifit Alcmaer, where he terminated his life in 1597, in the feventy-fifth year of his age.

Foreftus, (for by his Latin name he is beft known,) was one of the moft expert phyficians of his time: he was extremely induftrious, and his principal views were directed to the obfervation of difeafes, in which he manifefted, in numerous inftances, a confiderable degree of penetration and judgment. Haller, indeed, has thrown out fome fufpicions againft the hiftories of difeafe which he has detailed; and apprehends that he was occafionally more anxious to prove the juftnefs of his prognoftics, and the felicity of his cures, than to relate a true account of the fymptoms: but Boerhaave has praifed him highly for the care and attention which he has evinced in the collection of fo large a number of hiftories of difeafe. The following are the titles of his works. 1. "Obfervationum et Curationum Medicinalium five Medicinæ Theoricæ et Practicæ, libri 28." Francofurti, 1602, two vols. in folio.

2. A

2. A third volume of the fame work in 1604; and 3. A fourth volume, confifting of the 30th, 31ft, and 32d books in 1607. 4. In 1610 a fifth volume was printed, under the title of "Obfervationum et Curationum Chirurgicarum, libri quinque. Acceflerunt de incerto ac fallaci Urinarum judicio adverfus Uromentas et Urofcopos, libri tres;" in which the fallacy and abfurdity of the pretenfions of the urofcopifts are clearly pointed out. 5. A fixth and laft volume of thefe treatifes was publifhed at Frankfort, in 1611, with the title of "Obfervationum et Curationum Chirurgicarum, libri quatuor pofterius," folio. All thefe books of obfervations were printed feparately at Leyden, between the years 1589 and 1610, in 8vo. The three books relative to the urine, in 1583. Complete collections of the works of Foreftus have been fubfequently publifhed at various times and places.

FORE-THIGH, a term denoting the arm in the horfe and fome other animals. It is a point not much attended to in neat cattle-ftock.

FORE-TOP *of a Ship*. See TOP.

FORE-TOP-*Maft* is half the length of the fore-maft, and the fore-top-gallant-maft half the length of the fore-top-maft. See TOP-*maft*, MAST, and SHIP.

FORE-TOOTH. Striking out the fore tooth is a mayhem.

FORE-YARD. See YARD.

FOREZ, in *Geography*, a country of France, fo called before the revolution: it was a large and fertile valley interfected with fmall rivers, which run into the Loire. The principal towns were Montbrifon and Roanne. The foil is fertile, but the air is not deemed wholefome; it produces corn, hemp, excellent wine, chefnuts, and other fruits. In feveral places are mines of coal and iron, and medicinal fprings.

FORFANG. See FOREFANG.

FORFAR, in *Geography*, a royal burgh of confiderable antiquity, and the county town of Angus, or Forfarfhire, is fituated 13 miles N. of Dundee. At what time it was erected into a royal burgh is uncertain; a writ of *novodamus*, however, confirming its privileges as fuch, with parliamentary ratification, dated 1669, is ftill in poffeffion of the corporation. By virtue of this it is governed by a provoft, two bailiffs, and nineteen counfellors, elected annually; and conjointly with Perth, Dundee, St. Andrew's, and Cupar-fife, fends one member to the Britifh fenate. The ftreets are irregular, though they contain many well-built and handfome houfes. The church, an elegant and commodious ftructure, ftands nearly in the centre of the town. The feffions-houfe, lately re-built, has a neat front towards the market-place: the lower part is appropriated for prifoners, and the upper confifts of a fpacious fet of apartments for the tranfaction of municipal bufinefs, public meetings, and amufements; and here the fheriff holds his courts. The population of the town is about four thoufand; but it appears by the returns made to government in 1801, the number of houfes in the parifh amounted to 726, and inhabitants to 5165; the greater part of whom are employed in manufacturing of fail-cloth, canvas, Ofnaburghs for fheeting, and other kinds of coarfe linen-cloth, which find a market by the neighbouring fea-port of Dundee, on the river Tay. In the vicinity of Forfar are feveral lakes, or lochs, as they are here termed, *viz.* Reftenet, Fithie, and Forfar. On the banks of the firft are the remains of a priory, dependent formerly on the monaftery of Jedburgh. The fecond is about a mile in circumference, and the prefent proprietor has lately erected on its margin an elegant boudoir, or fummer-houe. In the loch of Forfar was formerly an ifland, on which ftood a caftle, the refidence of Malcolm Canmore; at which time it formed alfo a place of religious retirement for queen Margaret; but by the draining occafioned by digging for peat, this is now united to the land. From this lake iffues the rivulet, called Dean, which falls into the river Ifla, in its progrefs through Strathmore to the Tay.

FORFARSHIRE. See ANGUS-SHIRE.

FORFEITURE originally fignifies a tranfgreffion or offence againft fome penal law.

Forfeiture is defined by judge Blackftone to be a punifhment annexed by law to fome illegal act, or negligence in the owner of lands, tenements, or hereditaments, whereby he lofes all his intereft therein, and they go to the party injured, as a recompence for the wrong which either he alone, or the public together with himfelf, hath fuftained.

The word is formed of the bafe Latin *forisfactura;* whence *forfaitura,* and *forfaictura,* and the French *forfait. Forisfactura* comes of *forisfacere,* which, according to Ifidore, fignifies *to hurt,* or *offend, facere contra rationem;* and which is not improperly derived of *foris, out,* and *facere, to do;* q. d. an action out of rule, or contrary to the rules.

But with us, it is now more frequently ufed for the effect of fuch trangreffion, or the lofing fome right, privilege, eftate, honour, office, or effects, in confequence thereof, than for the tranfgreffion itfelf: as forfeiture of efcheats, forfeiture of goods, &c. A fee becomes vacant by the forfeiture or rebellion of the vaffal.

Goods forfeited, and goods confifcated, differ: thofe which have a known owner, who has committed fome offence, whereby he lofes his goods, are faid to be forfeited: thofe which an offender difavows, as not his own, and which are not claimed by any other, are faid to be confifcated; ftat. 25 Edw. III. Add, that forfeiture, or forfeit, is more general; and confifcation more particular, being principally ufed for fuch as forfeit only to the king's exchequer.

FORFEITURE, *full, plena forisfactura,* called alfo *plena vita,* is a forfeiture of life and member, and all elfe that a man has.

This obtains in criminal cafes, as where a perfon is attainted of treafon, felony, &c. There is alfo a forfeiture of lands, &c. in civil cafes. There are various degrees and various means, whereby lands, tenements, and hereditaments, may be forfeited. 1. By crimes and mifdemeanors: of thefe, the principal offences that induce a forfeiture of lands and tenements to the crown, are treafon, felony, mifprifion of treafon, præmunire, drawing a weapon on a judge, or ftriking any one in the prefence of the king's principal courts of juftice, and popifh recufancy, or nonobfervance of certain laws enacted in reftraint of papifts.

Forfeiture in criminal cafes is two-fold: *viz.* of real and perfonal eftates. 1. As to real eftates; by attainder in high treafon a man forfeits to the king all his lands and tenements of inheritance, whether fee-fimple, or fee-tail, and all his rights of entry to lands and tenements, which he had at the time of the offence committed, or at any time afterwards to be for ever vefted in the crown; and alfo all the profits of all lands and tenements which he had in his own right for life or years, fo long as fuch intereft fhall fubfift. (Co. Litt. 392. 3 Inft. 19. 1 Hal. P. C. 240. 2 Hawk. P. C. 448. Stat. 26 Hen. VIII. c. 13). This forfeiture relates backwards to the time of the treafon committed;

committed; ſo as to avoid all intermediate ſales and incumbrances (3 Inſt. 211.); but not thoſe before the fact: and, therefore, a wife's jointure is not forfeitable for the treaſon of her huſband, becauſe it was ſettled upon her previous to the treaſon committed. But her dower is forfeited by the expreſs proviſion of ſtatute 5 and 6 Edw. VI. c. 11. And yet the huſband ſhall be tenant by the curteſy of the wife's lands, if the wife be attainted of treaſon (1 Hal. P. C. 359.): for that is not prohibited by the ſtatute. But, though after attainder, the forfeiture relates back to the time of the treaſon committed, yet it does not take effect unleſs an attainder be had, of which it is one of the fruits; and, therefore, if a traitor dies before judgment pronounced, or is killed in open rebellion, or is hanged by martial law; it works no forfeiture of his lands, for he never was attainted of treaſon (Co. Litt. 13.) But if the chief juſtice of the king's bench (the ſupreme coroner of all England) in perſon upon the view of the body of one killed in open rebellion, records it, and returns the record into his own court, both lands and goods ſhall be forfeited. (4 Rep. 57.)

Forfeiture of lands and tenements to the crown for treaſon is by no means derived from the feodal policy, but was antecedent to the eſtabliſhment of that ſyſtem in this iſland; being tranſmitted from our Saxon anceſtors, (Ll. Aelfr. c. 4. Canut. c. 54.); and forming a part of the ancient Scandinavian conſtitution, (Stiernh. de jure Goth. l. ii. c. 6. l. iii. c. 3.) But in certain treaſons relating to the coin, it is provided by ſome of the modern ſtatutes (5 Eliz. c. 11. 18 Eliz. c. 1.) which conſtitute the offence, that it ſhall work no forfeiture of lands, ſave only for the life of the offender; and by all, that it ſhall not deprive the wife of her dower, (ſtat. 8 and 9 W. III. c. 26. 15 and 16 Geo. II. c. 28.) And in order to aboliſh ſuch hereditary puniſhment entirely, it was enacted by ſtatute 7 Ann. c. 21. that, after the deceaſe of the late pretender, no attainder for treaſon ſhould extend to the diſinheriting of any heir, or to the prejudice of any perſon, other than the traitor himſelf. By this act, the law of forfeiture for high treaſon would by this time have been at an end, if a ſubſequent ſtatute had not intervened to give them a longer duration. In order to explain this part of hiſtory, it ſhould be conſidered, that at the time of the union, the crime of treaſon in Scotland was, by the Scotch laws, in many reſpects different from that of treaſon in England; and particularly in its conſequence of forfeiture of entailed eſtates, which was more peculiarly Engliſh; yet it ſeemed neceſſary, that a crime, ſo nearly affecting government, ſhould, both in its eſſence and conſequences, be put upon the ſame footing in both parts of the united kingdoms. In new-modelling theſe laws, the Scotch nation and the Engliſh houſe of commons ſtruggled hard, partly to maintain, and partly to acquire, a total immunity from forfeiture and corruption of blood; which the houſe of lords as firmly reſiſted. At length a compromiſe was agreed to, which is eſtabliſhed by this ſtatute, *viz.* that the ſame crimes, and no other, ſhould be treaſon in Scotland, that are ſo in England; and that the Engliſh forfeitures and corruption of blood ſhould take place in Scotland, till the death of the then pretender; and then ceaſe through the whole of Great Britain; (Burnet's Hiſt. A. D. 1709): the lords artfully propoſing this temporary clauſe, in hopes, as it is ſaid, that the prudence of ſucceeding parliaments would make it perpetual. (Foſt. 250.) This has partly been done by the ſtatute 17 Geo. II. c. 39, (made in the year preceding the late rebellion,) the operation of theſe indemnifying clauſes being thereby ſtill farther ſuſpended, till the death of the ſons of the pretender.

In petit treaſon, miſpriſion of treaſon, and felony, the offender alſo forfeits his chattel intereſts abſolutely, and the profits of all eſtates of freehold during life; and, after his death, all his lands and tenements in fee-ſimple, (but not thoſe in tail,) to the crown, for a very ſhort period of time; for the king ſhall have them for a year and a day, and may commit therein what waſte he pleaſes; which is called the king's "year, day, and waſte." (2 Inſt. 37.) Formerly the king had only a liberty of committing waſte on the lands of felons, by pulling down their houſes, extirpating their gardens, ploughing their meadows, and cutting down their woods. And a puniſhment of a ſimilar ſpirit appears to have obtained in the oriental countries, from the decrees of Nebuchadnezzar and Cyrus, in the books of Daniel (ch. iii. v. 29.) and Ezra (ch. vi. v. 11.); which, beſides the pain of death inflicted on the delinquents there ſpecified, ordain, "that their houſes ſhall be made a dung-hill." But as this tended greatly to the prejudice of the public, it was agreed, in the reign of Henry I. in this kingdom, that the king ſhould have the profits of the land for one year and a day, in lieu of the deſtruction he was otherwiſe at liberty to commit; (Mirr. c. 4. § 16. Flet. l. i. c. 28.); and therefore Magna Carta provides, (9 Hen. III. c. 22.), that the king ſhall only hold ſuch lands for a year and a day, and then reſtore them to the lord of the fee; without any mention made of waſte. But the ſtatute 17 Edw. II. "de prærogativâ regis," ſeems to ſuppoſe, that the king ſhall have his year, day, and waſte; and not the year and day *inſtead* of waſte; which ſir Edward Coke, (and the author of the "Mirror" before him,) very juſtly look upon as an encroachment, though a very ancient one, of the royal prerogative, (Mirr. c. 5. § 2. 2 Inſt. 37.) This year, day, and waſte, are now uſually compounded for; but otherwiſe they regularly belong to the crown; and, after their expiration, the land would naturally have deſcended to the heir, (as in gavel-kind tenure it ſtill does,) if its feodal quality did not intercept ſuch deſcent, and give it by way of eſcheat to the lord. Theſe forfeitures for felony do alſo ariſe only upon attainder; and therefore a "felo de ſe" forfeits no lands of inheritance or freehold, for he never is attainted as a felon, (3 Inſt. 55.) They likewiſe relate back to the time of the offence committed, as well as forfeitures for treaſon; ſo as to avoid all intermediate charges and conveyances. As a part of the forfeiture of real eſtates, we might here mention the forfeiture of the profits of lands during life; which extends to two other inſtances beſides thoſe already ſpoken of, the ſtriking in Weſtminſter hall, or drawing a weapon upon a judge then ſitting in the king's courts of juſtice, (3 Inſt. 141.) And it ſeems that the ſame forfeiture is incurred by reſcuing a priſoner in or before any of the courts there, committed by the judges. (Cro. Jac. 567.)

2. The forfeiture of "goods and chattels" accrues in every one of the higher kinds of offence; in high treaſon and miſpriſion thereof, petit treaſon, felonies of all ſorts, whether they be clergyable or not, ſelf-murder or felony *de ſe*, petty larciny, ſtanding mute, and the above-mentioned offences of ſtriking, &c. in Weſtminſter hall. In *flight* alſo, on an accuſation of treaſon, felony, or even petit larciny, whether the party be found guilty or acquitted, if the jury find the flight, the party ſhall forfeit his goods and chattels. But the jury very ſeldom find the flight (Staundf. P. C. 183 *b.*) forfeiture being looked upon, ſince the vaſt increaſe of perſonal property of late years,

as too large a penalty for an offence, to which a man is prompted by the natural love of liberty.

Between the forfeiture of lands, and that of goods and chattels, there are some remarkable differences. 1. Lands are forfeited upon *attainder*, and not before; goods and chattels are forefeited by *conviction*. 2. In outlawries for treason or felony, lands are forfeited only by the judgment; but the goods and chattels are forfeited by a man's being first put in the *exigent*, without staying till he is *quinto exactus*, or finally outlawed; for the secreting himself so long from justice, is construed a flight in law. (3 Inst. 232.) 3. The forfeiture of lands has relation to the time of the fact committed, so as to avoid all subsequent sales and incumbrances; but the forfeiture of goods and chattels has no relation backwards; so that those only which a man has at the time of conviction shall be forfeited. Therefore a traitor or felon may *bonâ fide* sell any of his chattels, real or personal, for the sustenance of himself and family between the fact and conviction (2 Hawk. P. C. 454.); for personal property is of so fluctuating a nature, that it passes through many hands in a short time; and no longer could be safe, if he were liable to return the goods which he had fairly bought, provided any of the prior vendors had committed a treason or felony. Yet if they be collusively, and not *bonâ fide*, parted with, merely to defraud the crown, the law (and particularly the statute 13 Eliz. c. 5.) will reach them: for they are all the while truly and substantially the goods of the offender; and as he, if acquitted, might recover them himself, as not parted with for a good consideration; so in case he happens to be convicted, the law will recover them for the king.

Lands which a person hath in trust, or goods and chattels in right of another, or to another's use, &c. will not be liable to forfeiture. Though leases for years, in a man's own, or his wife's right, estates in jointenancy, &c. and all statutes, bonds, and debts due thereby, and upon contracts, &c. shall be forfeited. (Co. Litt. 42. 151. Staundf. 188)

3. There is a forfeiture by *alienation*, (which see,) contrary to law, which may be in *mortmain* (see MORTMAIN); to an alien, not only on account of his incapacity to hold the lands so alienated; which occasions him to be passed by in descents of land, but likewise on account of his presumption in attempting, by an act of his own, to acquire any real property, (see ALIEN); and by particular tenants, when the alienations are greater than the law entitles them to make, and divest the remainder or reversion; in which case they become forfeitures to him whose right is hereby injured; there is also an alienation by *disclaimer*, which see. 4. By non-presentation to a benefice, when the forfeiture is denominated a *lapse*, which see. 5. By *simony*, which see. 6. By breach or non-performance of *conditions*, annexed to estates, either expressed or legally implied. (See CONDITION.) 7. By *waste*, which see. 8. By breach of copyhold customs. (See COPYHOLD.) 9. By *bankruptcy*, which see. There are also various other forfeitures, besides those already recited, that are inflicted, by special statutes, for particular crimes and misdemeanors; some of which are *mala in se*, or offences against the divine law, either natural or revealed; but by far the greatest part are *mala prohibita*, or such as derive their guilt merely from their prohibition by the laws of the land; such as the forfeiture of 40s. per month by the stat. 5 Eliz. cap. 4. for exercising a trade without having served seven years apprenticeship to it; and the forfeiture of 10*l*. by 9 Ann. cap. 23. for printing an almanack without a stamp. Thus also artificers, going out of the kingdom and teaching their trade to foreigners, are liable to forfeit their lands, &c. by stat. 5 Geo. I. c. 27. (See MANUFACTURES.) In all cases where a penalty or forfeiture is given by statute, without saying to whom it shall be, or a limitation for a recompence for the wrong to the party, it belongs to the king. (Stra. 50. 828. 2 Vent. 267.) And such forfeitures shall be construed favourably. (Cowp. 585. 8.) Blackst. Com. vol. ii. p. 267, &c. 420, &c. vol. iv. p. 370, &c. 416. &c.

Goods or lands of one arrested for felony shall not be seized before he is convict or attaint of the felony, on pain of forfeiting double value. (Stat. 1 R. III. c. 3.) Goods of a felon, &c. cannot be seized before they are forfeited; though they may be inventoried, and a charge made thereof before indictment. (Wood's Inst. 659.) When goods of a felon are pawned before he is attainted, the king shall not have the forfeiture of the goods till the money is paid to him to whom they were pawned. 3 Inst. 17. 2 Nels. Abr. 874. 5.

The true reason of any forfeiture, for crimes, says judge Blackstone, is this: that all property is derived from society, being one of those civil rights which are conferred upon individuals, in exchange for that degree of natural freedom, which every man must sacrifice when he enters into social communities; if, therefore, a member of any national community violates the fundamental contract of his association, by transgressing the municipal law, he forfeits his right to such privileges as he claims by that contract; and the state may very justly resume that portion of property, or any part of it, which the laws have before assigned him. Hence, in every offence of an atrocious kind, the laws of England have exacted a total confiscation of the moveable or personal estate; and in many cases a perpetual, in others only a temporary loss of the offender's immoveables or landed property; and have vested them both in the king, who is the person supposed to be offended, being the one visible magistrate in whom the majesty of the public resides. Blackst. Com. vol. i. p. 299.

FORFEITURE *of marriage*, *forisfactura maritagii*, a writ which formerly lay against him, who, holding by knight's service, and being under age, and unmarried, refused her whom the lord offered him, without his disparagement, and married another. F. N. B. 141. Reg. Orig. 163.

FORFEX, in *Surgery*, a pair of scissars wherewith things may be cut.

The word is sometimes also used for pincers, nippers, or pliers; and is often confounded with forceps. Blanchard, and after him Quincy, describes a forfex as an instrument for drawing teeth.

FORFICULA, in *Entomology*, a genus of the coleoptera order, in the Linnæan system, distinguished by the following essential characters: antennæ setaceous; feelers unequal and filiform; wing-cases about half the length of the abdomen; wings folded up under the wing-cases; tail armed with forceps. This is the earwig of English writers.

The forficulæ can scarcely be considered with propriety as appertaining to the coleopterous tribes of insects; and later writers seem so well assured of this, that few continue in this respect to follow the example of Linnæus. Fabricius, with more consistency, has placed them in his class *ulonata*, together with the blattæ, the mantes, phasmæ, and other analogous families; and hence we may conceive, had Fabricius been himself disposed to adopt the system proposed by Linnæus, he would have placed the forficulæ in the hemiptera instead of coleoptera order. There are still objections to this, and we cannot avoid approving, in preference to either, the suggestion of Latreille, that they constitute

constitute an intermediate order between the coleoptera and hemiptera. La Marck had previously constituted a new order for the reception of the forficulæ, blattæ, and other insects of the same natural tribe, to which he gave the name orthoptera; yet he does not place it between the two orders before mentioned: it stands in his arrangement between the coleoptera and neuroptera.

The two sexes of the forficulæ differ a little in general form, and also in the shape and bulk of the abdomen, as well as the forceps at the extremity of the abdomen. The female is distinguished by the superior size of the abdomen. The eggs are large, white, and glossy; and the larvæ, when hatched, considerable in proportion to the magnitude of the egg from whence they are excluded. Few of the insect tribe evince more attention to their young than the females of the forficulæ. In the first instance, they are particularly careful to deposit their eggs in places of security, and are often seen sitting on them for hours together; and they are also known to regard the infant brood with tenderness, the young remaining in society with the parent some time after being produced from the egg. The forficulæ live in moist places, among plants, or under rotten wood and stones; and are injurious in particular to the kitchen and flower gardens, as the ravages of the more frequent species, the common earwig, sufficiently attest.

Species.

Herculeana. Forceps elongated, in the middle beset with a single tooth, black; legs rufous. Fabr. Suppl.

The largest of this genus. The head is black; antennæ ferruginous; thorax flat, smooth, and black; wing cases short, deep black, and without spots; body deep black; forceps nearly the length of the body. This species inhabits the island of St. Helena.

Ruficollis. Black; thorax and wing-cases in the disc, with the legs ferruginous. Fabr.

A species of large size, found in Africa. The head is black; antennæ testaceous, and consisting of eleven joints; abdomen black; forceps curved, black, and armed with a single tooth at the base.

Gigantea. Pale, variegated above with black; tail bidentated; forceps advanced and armed with a single tooth. Fabr. *Forficula bilineata*, Herbst. *Gigantic earwig*, Donov. Brit. Inf.

Inhabits the south of Europe, and is rare in Britain; its magnitude double that of the common kind.

Auricularia. Wing-cases white at the tip; forceps curved, and denticulated at the base; antennæ of fourteen joints. Linn. Fn. Suec., &c. *Forficula major*, Degeer. *Scarabæus subrufus, cauda furcata*, Lister. *Vermis auricularius*, Frisch. *Earwig*, Donov. Brit. Inf.

Very common in wet places throughout Europe; infests fruit-trees and flowers, and is said to creep into the ears of such as sleep in the open air; whence the name of earwig, or ear-piercer.

Annulata. Black; extreme joint but one of the antennæ, with the legs white. Fabr.

A small species. The antennæ contain thirteen joints, and are black, except the first joint, and the last joint but one; legs pale; thighs with a brown annulation. It inhabits South American islands.

Bipunctata. Black; hind part of the head, with the legs rufous; wing-cases with a white spot. Fabr.

Native of Italy. The antennæ contain only eleven joints.

Biguttata. Black; wing-cases with a yellow spot; forceps incurved, denticulated in the middle. Fabr.

A species of moderate size, found in Hungary.

Fulvipes. Black; mouth, sides of the abdomen, and legs white. Fabr.

Large; the antennæ pale, and containing eleven joints; the forceps large, and denticulated within. This species inhabits Cayenne.

Albipes. Black; thorax behind; base of the wing-cases, wings, and legs white. Fabr.

About the middle size, and inhabits the South American islands.

Minor. Wing-cases testaceous, and immaculate; antennæ of ten joints. Linn.

A native of Europe, and is esteemed a rare species. The antennæ are whitish at the tip.

Pygmæa. Black; thorax square, with pale margin; antennæ and legs testaceous. Fabr.

Infests plants in Guinea. A small species.

Flexuosa. Forceps flexuous; wing-cases with yellow dots. Fabr.

Native of Cayenne. The body is brown, and the forceps ferruginous at the base.

Dentata. Antennæ of ten joints; body brown; edges of the thorax and legs pale; forceps toothed at the base. Fabr.

Inhabits Madeira. The abdomen is brown, extremity of the abdomen armed with four teeth; forceps large, curved, and black.

Erythrocephala. Black; head and tail ferruginous; spots on the abdomen, and legs yellowish. Fabr.

A species of moderate size, and inhabits South American islands.

Elongata. Dusky; margin of the thorax, wing-cases, and legs pale; forceps with a single tooth at the base. Fabr.

Inhabits same islands as the last, and resembles it in size.

Morio. Deep black; antennæ with a white band. Fabr.

A large species, found in Otaheite. The antennæ consist of eighteen joints of a black colour, except the first, fourth, and fifteenth articulations, which are white; the wings are hyaline, with the tip black; and the legs ferruginous at the end.

Parallella. Black; edges of the thorax, wing-cases, and legs pale; forceps straight and unarmed. Fabr.

Native of Madeira.

Flavipennis. Black; wing-cases yellowish, with a black suture. Fabr.

About the middle size, and inhabits Senegal. The head is obscure rufous, with a black frontal spot; thorax margined and blackish; body black; legs yellow.

Pallipes. Forceps long, with a single tooth; body black; legs white. Fabr.

A large species. The antennæ pale; wings white, with a brown line at the tip; forceps nearly as long as the abdomen, ferruginous, and tipped with black.

Livida. Livid; very minute; forceps very minutely denticulated. Linn.

Native of Europe.

Forficula *Marina*, the *sea earwig*, a name given by authors to an insect frequently found about the sea-shores, and having some sort of external resemblance to the common earwig. It is of the size of the common earwig, and is of a mixed colour, of a deep black and a silvery white. The shoulders are somewhat gibbose, the eyes standing close to one another on the summit of the head; the antennæ are long and very slender. It has eight pair of legs on the anterior part of the body, and eight pair more at the hinder

der part, and there are three or four briſtles at the tail. It moves about very ſwiftly, and lives on rocks and among ſtones.

FORGAVEL, Forgabulum, in *Antiquity*, a ſmall reſerved rent in money, or quit-rents.

FORGE, properly ſpeaking, is any kind of furnace, the heat of which is afforded by the action of bellows. The term, however, is now more particularly applied to the common ſmith's forge, and to the forge uſed for the manufacture of bar iron. For a deſcription of the latter, ſee Iron.

A peculiar ſpecies of forge is alſo uſed for the manufacture of ſhear ſteel; for an account of which, ſee Steel. The common ſmith's forge requires bellows of different kinds and ſizes, agreeable to the nature of the work.

The double bellows are chiefly uſed for the working of iron, and ſingle ones for ſteel. The double bellows are apt to blow ſome time after the workman takes out one of his irons; and as in working ſteel, the heat is leſs than that employed for iron, the rod of ſteel, if left in the fire, would be often liable to be burned, as the workmen term it. The ſingle bellows are, therefore, better adapted for this work, becauſe the blaſt does not continue after the workman leaves the bellows.

The fire-place is generally a flat hearth, nearly on a level with the blaſt, on which the fuel is placed, which moſtly conſiſts of the coaks of pit-coal. In ſmithery, however, and more particularly for the working of ſteel, the coal ſhould be carefully ſelected, as free from pyrites as poſſible, as the ſulphur of that ſubſtance is found to be very injurious to the metal. In all caſes where welding is required, the ſulphur totally prevents the adheſion. If pyrites ſhould by accident get into the fire, the beſt means to get rid of it is to throw a quantity of iron-filings into the fire, which immediately takes up the ſulphur.

After the coaks have been uſed for ſome time, the pieces become exceedingly ſmall, and are ſo light as to be blown away by the bellows, ſeparating the fuel from the iron. This inconvenience is removed by taking away theſe ſmall particles from time to time. It, however, may be much eaſier removed by a contrivance which is not in general uſe. This is effected by making the bed of the hearth a grate, about four inches below the level of the blaſt. The ſmall duſt, paſſing through the grate upon an inclined plane, is carried away, leaving nothing on the hearth but the proper fuel.

In moſt of theſe forges, particularly where great heat is required, the nozel of the bellows is not preſented to the fire. A thick iron tube is placed between the bellows and the fire, called the tuiron. It is funnel-ſhaped at the end next the bellows, for the reception of the nozel of the bellows; and has a cylindric hole, from about the middle to the oppoſite end, a little leſs than the aperture at the nozel of the bellows.

Before means were contrived of preventing the tuiron from being raiſed above a certain temperature, it was very ſpeedily worn out by the heat and the oxydation of the iron. This evil has been removed by the invention of what is now called the water-tuiron. It conſiſts of ſomething like the common tuiron, having a crooked tube paſſing through the body of it. One end of the tube, at ſome diſtance from the tuiron, is inſerted into the bottom of a tub, filled with water; the other end coming from the tuiron paſſes over the top of the tub: ſo that the cold water has conſtant acceſs to the body of the tuiron, which the heat of the fire raiſes into vapour. This vapour paſſes up the other tube, which condenſing, is diſcharged into the tub. By this means, it is evident that the tuiron can never much exceed the heat of boiling water. This contrivance prevents a much greater evil than the deſtruction of the tuiron. The oxyd of iron, which is conſtantly formed from the heated iron, combining with the earthy matter of the coal, forms a very fuſible ſcoria, which, if the tuiron were not kept cool, would be apt to adhere to it, and ſtop up its aperture. This ſcoria may be eaſily diſcharged through the grate of the hearth, which would at any rate be an interruption to the blaſt.

The large quantity of oxygen conſtantly blown into the fire, upon the iron, at ſo high a temperature, cauſes a very rapid oxydation of the metal. This oxyd has ſome tendency to vitrification, and conſequently to prevent the iron, in ſome meaſure, from the future attacks of oxygen. Since, however, ſilex forms a very fuſible vitreous compound with the oxyd of iron, the ſmith is in the habit of uſing the powder of any ſtone of a ſandy nature. When the iron becomes nearly of a welding heat, he takes it out to immerſe it in the powdered ſand. A thin fluid ſubſtance is immediately ſeen to flow over the heated ſurface, which defends the metal from the oxygen. In the welding of one piece of iron to another, the uſe of ſand is highly important, and more particularly in welding ſteel to iron. When the two ſurfaces are brought together, the oxyd of iron, with the flint, is removed by reaſon of its great fluidity. If, however, the oxyd were not rendered thus fluid, it would remain and prevent the adheſion of the ſurfaces.

Lead is found to be very injurious to the ſmith's fire; it combines with ſomething on the ſurface of the iron, which makes it unfit for welding. Its preſence is eaſily known, as the iron affected with it makes a brown mark upon the anvil. The ſtrongeſt heat of a forge is at about two inches from, and a little above the aperture of the tuiron.

A forge is alſo uſed by braziers, copper-ſmiths, and in the plated manufactories. This conſiſts of a hearth like the ſmith's forge, and a pair of bellows. The fuel is moſtly coak, but ſometimes for particular purpoſes charcoal. It is uſed for annealing their metal previous to working it, and alſo for ſoldering.

The forge fire is not well calculated for the fuſion of metals, ſince the ſide of the crucible next the blaſt is liable to be cooled, which generally cauſes it to break. The portable blaſt furnace is however better adapted than the common forge, as the air is introduced at bottom, like the common air furnace. See Furnace.

Forging conſiſts in changing the form of ſuch malleable metals as may have been heated for that purpoſe in the fire of the forge, by means of the hammer and other inſtruments uſed in ſmithery.

Several of theſe proceſſes are carried on by machinery worked by water or ſteam. In the manufacture of bar iron, very large maſſes of this metal, called blooms, are drawn into bars by an immenſe hammer, worked by a water wheel, or the ſteam-engine. See Iron.

The forging of ſcythes is alſo performed by ſimilar power, which by the workmen is called ſkelping. See Scythe.

Forging, however, more properly belongs to the forming of various utenſils from iron, and other malleable metals.

The anvil, on which the metal is laid, conſiſts of a large maſs of wrought iron, faced with hardened ſteel, and ground ſmooth on the ſurface. The hammers are of the ſame materials, and are of different ſizes, agreeable to the nature of the work. If the work is heavy, beſides the perſon who holds the ſubſtance to be hammered, a ſecond, and ſometimes a third and fourth perſon ſtrike in turns at the heated body. If the body requires to be made round, inſtruments

ſtruments called *ſwages* are employed. They conſiſt of two maſſes of iron faced with ſteel, and hardened, one lying upon the anvil, or faſtened into a groove in the anvil, and the other held in the hand, by means of a piece of hazel ſtick twiſted round it. In the faces of each of theſe ſwages a proper ſized groove is made, which, for ſwaging round bodies, is a ſegment of a cylinder. The body to be ſwaged being laid upon the lower one, the upper ſwage is placed upon it, on which a perſon ſtrikes with a large hammer, while the body to be made cylindrical is turned round. A variety of other inſtruments are uſed according to the nature of the work to be done. Iron admits of being forged with greater facility than ſteel, as it is much ſofter, and can be heated to a much greater heat, which ſtill makes it ſofter. Indeed iron is generally heated to a welding heat, in order that its parts, which are frequently looſe and unconnected, may be made ſound.

Copper may be forged into any ſhape, but will not bear more than a red heat, and of courſe requires to be heated often. The bottoms of large boilers are frequently made by a large forge hammer worked by machinery. The bolts of copper uſed for ſhips, and other purpoſes, are moſtly made by the hammer. Silver, gold, and platina will alſo admit of forging into any form. Of the former metal, ſilver knives are made very neatly by the hammer. The heat at which it is worked ſhould be barely that of ignition.

It is remarkable that alloys of the malleable metals, although very malleable when cold, will not bear the hammer when heated.

Forge is alſo uſed for a large furnace, wherein iron ore, taken out of the mine, is melted down.

But this is not ſo properly called a forge as a *furnace*; which ſee.

Forge is more properly uſed for another kind of furnace wherein the iron ore, melted down and ſeparated in a former furnace, and there caſt into ſows and pigs, is heated; and fuſed over again, and beaten afterwards with large hammers, and thus rendered more ſoft, pure, ductile, and fit for uſe.

Of theſe forges there are two kinds, which the iron ſucceſſively paſſes through, before it comes to the ſmith.

The firſt is called the *finery*, where the pigs are worked into groſs iron, and prepared for the ſecond, which is called the *chafery*, where it is farther wrought into bars fit for uſe.

Forge-*mills*. See Mill.

Forge-*volant*, or *Flying forge*, means ſuch an arrangement of the ſeveral implements and materials, neceſſary for the eſtabliſhment of a ſmith's forge, within a cart or waggon, as may qualify it to accompany an army during a campaign, with the ſame facility as the ſeveral carriages appertaining to the train of artillery.

It will be immediately underſtood, that much contrivance, and great attention to regularity, are needful to accompliſh and preſerve ſo eſſential a purpoſe; the more ſo, as the whole weight of the forge and its ſupplies of fuel, &c., ſhould not exceed half a ton when conveyed in a cart; nor a whole ton when carried in a waggon. The beſt mode is to place the anvils and their blocks in ſuch a poſition as to balance well, but to be eaſily lifted in and out. For minor purpoſes two or three ſmall anvils may be attached temporarily to the hinder tranſom of the cart-body. There ſhould be a water trough, a furnace, and a pair of bellows, all within a frame of iron plate, properly rivetted and cloſed with hard ſolder, ſo as to be firm, and to prevent latent ſparks from ſetting fire to the machine, or to its contents. The tail-board ſhould let down to a level with the bottom of the cart, and be ſuſpended in that direction by ſtrong ſegments of iron; ſo as to be well fixed, and to reſiſt preſſure either upwards or downwards; the ſides around the furnace and bellows ought to be divided into compartments for the reception of fuel, (generally charcoal,) ſufficient for immediate ſervice, and for the aſſortment of nails, ſcrews, clouts, ſwivels, pins, nuts, horſe ſhoes and nails, bridle chains, buckles, &c., in ſmall quantities, ſo that any thing wanting immediate repair may be fitted without the ſmalleſt delay.

Every forge ſhould carry implements ſufficient to employ forty men; of whom two ſhould be fire-men, ſix ſledge-men, ten light hammer-men, two ſcrew and nut-men, and the reſidue, file-men, or workers on cold metal. If the apparatus be carried in a waggon that can contain two double forges, or furnaces, double the number of men may be employed; ſmall anvils, in either caſe, as alſo vices, being made to ſcrew, or to hook, on to the ends of the ſeveral projecting tranſoms, and even to the naves of the wheels, of which the iron tires become uſeful for light hammer work. The total weight of a forge-waggon, excluſive of its contents, ſhould never exceed 15 cwt. In our arſenals they are made even lighter, their average being 13 cwt. 2 qrs. 14 lbs. Being rated with what are called "Park carriages," it is neceſſary they ſhould conform as nearly as may be practicable with others of their claſs, and be drawn by the number of horſes, &c. uſually employed for light machines.

Forge *for red-hot balls*, is a place where the balls are made red-hot before they are fired off: it is conſtructed about five or ſix feet below the ſurface of the ground, of ſtrong brick-work, and an iron grate, upon which the balls are laid with a large fire under them.

FORGER *of falſe deeds*, ſignifies either him that fraudulently makes and publiſhes falſe writings, to the prejudice of any man's right, or elſe the writ that lies againſt him who commits this offence.

Fitz. Nat. Br. fol. 6). B. ſays, that a writ of deceit lies againſt him who commits this offence; and the penalty of it is declared in the ſtat. 5 Eliz. cap. 14.

FORGERY, in *Law*, may be defined (at common law) the fraudulent making or alteration of a writing to the prejudice of another man's right; and it is an offence which was puniſhed by the civil law with deportation or baniſhment, and ſometimes with death: and by the common law the offender may ſuffer fine, impriſoment, and pillory. Alſo, by a variety of ſtatutes, a more ſevere puniſhment is inflicted on the offender in many particular caſes, which are ſo multiplied of late as almoſt to become general. The principal inſtances are as follow:

By ſtatute 5 Eliz. c. 14. to forge or make, or knowingly to publiſh or give in evidence, any forged deed, court roll, or will, with intent to affect the right of real property, either freehold or copyhold, is puniſhed by a forfeiture to the party grieved of double coſts and damages; by ſtanding in the pillory, and having both his ears cut off, and his noſtrils ſlit, and ſeared; by forfeiture to the crown of his lands, and by perpetual impriſonment. For any forgery relating to a term of years, or annuity, bond, obligation, acquittal, releaſe, or diſcharge of any debt or demand of any perſonal chattels, the ſame forfeiture is given to the party grieved; and on the offender is inflicted the pillory, loſs of one of his ears, and a year's impriſonment; the ſecond offence in both caſes being felony without benefit of clergy.

Beſides this general act, a multitude of others, ſince the revolution (when paper credit was firſt eſtabliſhed) have inflicted

flicted capital punishment on the forging, altering, or uttering as true, when forged, of any bank bills or notes, or other securities (stat. 8 and 9 W. III. c. 20. § 36. 11 Geo. I. c. 9. 12 Geo. I. c. 32. 25 Geo. II. c. 13. 13 Geo. III. c. 79.); of bills of credit issued from the exchequer, according to the several acts for issuing them; of South-sea bonds, &c. (stat 9 Ann. c. 21. 6 Geo. I. c. 4. and 11. 12 Geo. I. c. 32.); of lottery tickets or orders, by the several lottery acts; of army or navy debentures (stat. 5 Geo. I. c. 14. 9 Geo. I. c. 5.); of East India bonds (stat. 12 Geo. I. c. 32.); of writings under seal of the London, or Royal Exchange assurance (stat. 6 Geo. I. c. 18.); of the hand of the receiver of the pre-fines (32 Geo. II. c. 14.); or of the accountant-general and certain other officers of the court of chancery (12 Geo. I. c. 32); of a letter of attorney, or other power to receive or transfer stock or annuities; and on the personating a proprietor thereof, to receive or transfer such annuities, stock, or dividends (8 Geo. I. c. 22. 9 Geo. I. c. 12. 31 Geo. II. c. 22. § 77.); also on the personating, or procuring to be personated, any seaman, or other person, entitled to wages or other naval emoluments, or any of his personal representatives; and the taking, or procuring to be taken, any false oath in order to obtain a probate, or letters of administration, in order to receive such payments; and the forging, or procuring to be forged, and likewise the uttering or publishing, as true, of any counterfeited seaman's will or power (stat. 31 Geo. II. c. 10. 9 Geo. III. c. 30.); to which may be added, though not strictly reducible to this head, the counterfeiting of Mediterranean passes, under the hands of the lords of the admiralty, to protect one from the piratical states of Barbary (4 Geo. II. c. 18.); the forging or imitating of any stamps to defraud the public revenue (according to the several stamp acts); and the forging of any marriage register or licence (26 Geo. II. c. 33.); all which are by distinct acts of parliament made felonies without benefit of clergy. By statutes 13 Geo. III. c. 52. and 59. forging or counterfeiting any stamp or mark to denote the standard of gold and silver plate, and certain other offences of the like tendency, are punished with transportation for fourteen years. By statute 12 Geo. III. c. 48. certain frauds on the stamp duties, therein described, principally by using the stamps more than once, are made single felony, and liable to transportation for seven years; and the same punishment is inflicted by stat. 13 Geo. III. c. 38. on such as counterfeit the common seal of the corporation for manufacturing plate glass (thereby erected), or knowingly demand money of the company by virtue of any writing under such counterfeit seal.

There are also certain other general laws with regard to forgery; of which the first is 2 Geo. II. c. 25. whereby the first offence in forging or procuring to be forged, acting or assisting therein, or uttering or publishing as true, any forged deed, will, bond, writing obligatory, bill of exchange, promissory note, indorsement or assignment thereof, or any acquittance or receipt for money or goods, with intent to defraud any person (or corporation) is made felony without benefit of clergy. And by statutes 7 Geo. II. c. 22. and 18 Geo. III. c. 18. it is equally penal to forge or cause to be forged, or utter as true, a counterfeit acceptance of a bill of exchange, or the number or principal sum of any accountable receipt for any note, bill, or any other security for money; or any warrant or order for the payment of money, or delivery of goods. There is now hardly a case to be conceived, wherein forgery, that tends to defraud, whether in the name of a real or fictitious person, is not made a capital crime. (Fost. 116, &c.) Blackst. Com. B. iv.

FORGES, in *Geography*, a town of France, in the department of the Lower Seine, and chief place of a canton in the district of Neufchatel, famous for its mineral waters of a ferruginous quality; near the source of the Epte, nine leagues N.E. of Rouen, and 25 N.N.W. of Paris. The place contains 1,201, and the canton 11,757 inhabitants, on a territory of $242\frac{1}{2}$ kiliometres, in 31 communes.

FORGESIA, in *Botany*, so named by Commerson the French botanist and traveller, in honour of his friend and patron, M. Desforges, governor of the isle de Bourbon, at the time when he investigated the vegetable productions of that country with so much success. Juss. 164. (Desforgia; Lamarck. Illustr. t. 125.) Class and order, *Pentandria Digynia*. Nat. Ord. *Campanulaceæ*, Juss.

Gen. Ch. *Cal.* Perianth superior, in five deep, ovate, acute, equal, spreading, permanent segments. *Cor.* of five equal, oblong, upright petals, twice the length of the calyx, cohering by their broad bases, reflexed at the tip, clothed with short hairs on their inner side, especially upwards. *Stam.* Filaments five, equal, the length of the corolla, cylindrical, firm, erect, roughish; anthers fixed, incumbent, heart-shaped, two-lobed. *Pist.* Germen inferior, turbinate, convex at the top, of two cells; styles two, cohering in a columnar form, erect, the length of the stamens, permanent, roughish; stigmas divaricated, globose, undivided. *Peric.* Capsule encircled with the calyx, opening at the top by two valves, crowned with the styles, of two cells. *Seeds* numerous, small.

Eff. Ch. Petals five, rough on their inside. Capsule inferior, of two cells and two valves, crowned by the styles.

Obs. Commerson observed that the styles are sometimes, though very rarely, three, the cells and valves of the fruit agreeing with them in number. Jussieu suggests that this genus is akin to his order of *Onagræ*, as well as to *Heuchera* amongst his *Saxifragæ*. We follow him in referring it to the *Campanulaceæ* for the present, though it ill accords with the characters of that order, having two styles. It has indeed somewhat of the habit of *Campanula aurea*, but little else in common. To *Escallonia*, one of Jussieu's *Onagræ*, it has a very great affinity in every part, except the two styles, which last mark seems of the less moment, as their germens accord in having two cells. Wherever *Escallonia* is to remain, *Forgesia* must certainly, as we find Lamarck has observed, go along with it. In the artificial system, the latter should follow *Heuchera*; in the natural, or rather *conjectural* one (if we may be allowed the term), it is related to *Ribes*, *Heuchera*, *Escallonia*, *Fœtidia*, *Philadelphus*; scarcely, if at all, to *Campanula*.

1. F. *borbonica*. (Desforgia borbonica; Lamarck. Illustr. v. 2. 71.) Native of the isle de Bourbon. A *tree*, smooth in every part, except the flower. *Leaves* numerous, scattered, three or four inches long, obovate, acute, serrated, with one rib and numerous transverse veins; paler beneath; on stalks an inch long. *Panicles* about the ends of the branches, axillary and terminal, spreading, with small, oblong, scattered bracteas. *Flowers* the size of *Campanula aurea*; of their colour we have no information. The whole plant dries of a dull brown. The young shoots are resinous, somewhat astringent, scarcely aromatic.—In this case we tolerate a specific name derived from that of a country, though against sound principle, for the sake of the connection between that country and the person to whom the genus is dedicated. S.

FORGING, in the *Mechanic Arts*, the act of beating or hammering iron on an anvil, after having first made it red-hot in the forge, in order to extend it into various forms, and fashion it into works.

Iron is hammered and forged two ways; either by the force of the hand, in which there are ufually feveral perfons employed, one of them turning the iron, and hammering likewife, and the reft only hammering.

Or, it is done by the force of a water-mill, which raifes and works feveral huge hammers, beyond the force of man, under the ftrokes whereof the workmen prefent large lumps or pieces of iron, which are fuftained, at one end, by the anvils, and, at the other, by iron chains faftened to the cieling of the forge.

This laft way of forging is only ufed in the largeft works, as anchors for fhips, &c. which ufually weigh feveral thoufand pounds. For the lighter works, a fingle man fuffices to hold, heat, and turn, with one hand, while he ftrikes with the other. Each purpofe for which the work is defigned requires its proper heat. If it be too cold, it will not feel the weight of the hammer, as the fmiths call it, *i. e.* it will not ftretch or give way; and if it be too hot, it will red-fear, *i. e.* it will break or crackle under the hammer.

The feveral heats the fmiths give to their irons, are, 1. A blood-red heat. 2. A white-flame heat. 3. A fparkling or welding heat. See FORGE.

FORGING *Over*, in *Sea Language*, denotes the art of forcing a fhip violently over a fhoal, by the effort of a great quantity of fail.

FORHAD, in *Geography*, a town of Perfia, in Chorafan; 40 miles E.S.E. of Niefabour.

FORI, a town of Japan, in the ifland of Niphon; 10 miles E. of Scoda.

FORIANI, a town of the department of Golo, in the ifland of Corfica; four miles S. of Baftia.

FORK-TAIL, among the *Fifhermen of England*, a name given to the falmon, while in the fourth year's growth, and not yet come to what they call a falmon.

FORKED *Head*, in *Geography*, a cape on the S. coaft of the ifland of Cape Breton. N. lat. 45° 42′. W. long. 60° 4′.

FORKED *Deer river*, a river of America, which runs into the Miffiffippi. N. lat. 35° 22′. W. long. 90° 4′. It is about 76 yards wide, 7 miles from its mouth.

FORKED *Beard, great*, in *Ichthyology*, a name given on the coaft of Cornwall to the *blennius phycis* of Linnæus.

FORKED *Heads*, among *Hunters*, thofe horns of deer which bear two croches on the top, or which have their croches doubled.

FORKEN, in *Geography*, a town of Pruffia, in the province of Samland; 4 miles N.E. of Fifchaufen.

FORKS, a townfhip of America, in Northampton county, Pennfylvania, having 884 inhabitants.

FORLANA, Ital. in *Mufic*, the air of a dance of the fame name, very common at Venice, efpecially among the Gondolieri. Its time is $\frac{6}{8}$ played with fpirit; and the dance is very gay. It is called *Forlana* from being invented and common in Friuli, where the inhabitants are called *Forlani*.

FORLAZZO, in *Geography*, a town of Naples, in the province of Bari; 11 miles S.E. of Teramo.

FORLET-LAND, a term applied to fuch land, in the bifhopric of Hereford, as was formerly granted or leafed out, " dum epifcopus in epifcopam fteteris," in order that the fucceffor might have it for his prefent income. This cuftom is now however in difufe, and fuch lands let or granted, as in other cafes, by leafe, but they ftill retain the name.

FORLI, in *Geography*, a town of Italy, in the department of the Amona, the fee of a bifhop, fuffragan of Ravenna; containing ten churches and many convents. It was anciently called " Forum Julii." Having been for feveral ages under the dominion of the Romans, Forli recovered its liberty under the exarchs, and became powerful enough to gain confiderable advantages in a war with its neighbours. In 1248 it was taken by the Bolognefe, but found means to emancipate itfelf from their yoke in the year 1296. After a civil war Forli was fo reduced as to be obliged to fubmit to the popes. The town is furrounded with ftrong walls and folid towers; the ditches are large, and defended with low works; 33 miles S.E. of Ravenna. N. lat. 44° 13′. E. long. 12° 1′.

FORLIMPOPOLI, a town of Italy, in the department of the Amona; formerly called " Forum Populi," and one of the " fora" on the Via Emilia, where the Roman magiftrates kept their courts. In the year 700 it was ruined by the Lombards, but afterwards rebuilt by the people of Forli. Pope Gregory XI. who refided at Avignon, having been offended by its inhabitants, it was razed by order of cardinal d'Avila, his legate-general in Italy. Such was the furious refentment of this prelate, that in the year 1370 he caufed it to be fown with falt, and a harrow to pafs over its ruins; the pope alfo transferred the epifcopal fee to Bertinero, about 1½ mile diftant from it. About twenty years after this defolation Ordeloffi, prince of Forli, re-eftablifhed the town and fortified it with a good citadel. But being afterwards fubjected to the dominion of the popes, it funk into a ftate of irrecoverable defolation.

FORLORN HOPE, a defignation applied, in the *Military Profeffion*, to that party which is to take the lead on any duty fuppofed to be fo pregnant with danger as to leave but little hope of furviving the enterprife. It, however, generally happens, that the forlorn-hope fuffer far lefs than circumftances fhould warrant us to expect: many inftances have occurred in which they have fuftained but little lofs, and an examination of the feveral details of cafualties after a breach has been ftormed, a wall fcaled, or a defperate attack made on fome entrenchment, will be found to throw the fevereft part of the carnage upon thofe troops which follow immediately after the forlorn-hope.

This may appear curious, and contrary to reafon, but examination of the events ordinarily attendant on fuch arduous duties will folve the problem. In advancing towards a breach, &c. it is ufual to keep up a heavy fire, efpecially of grape and cafe-fhot, upon thofe parts towards which the detachment is proceeding; whereby there ufually appears but little oppofition in that direction; the forlorn-hope thus advance with at leaft as much fafety as their immediate fupporters, and when they are on the creft of the breach often prefent an equal front with the defenders, againft whom they contend nearly on equal terms. But as this conteft fometimes lafts for a long time, thofe who may be detained at the foot of the breach, muft remain expofed to whatever fire the garrifon may be able to direct towards that quarter; for which purpofe every exertion, though temporary only, is ever made. Hence every gun that can be brought to bear, even though openly expofed to the fire of the befiegers' batteries, or even to their mufketry, will open upon the foot of the breach, which is ever the fcite of dreadful havock.

Few ftorming-parties are exempt from volunteers: it is, indeed, in fuch " hair-breadth efcapes in the deadly breach" that the crown of military glory is to be found; confequently, the forlorn-hope is feldom taken in the ordinary routine of duty, but is completed by the affociation of men who aim at celebrity, and confequently at promotion; and

and who ſtake their whole *hope* upon what is generally conſidered a moſt *forlorn* ſpeculation.

The party whoſe claim to the deſignation is genuine, rarely exceeds twenty or thirty firelocks, uſually commanded by a ſubaltern, or at the utmoſt by a captain. The reſidue of the volunteers, of all claſſes, are formed into what is called the "ſtorming-party," to which any neceſſary augmentation is ſupplied from choice corps, and eſpecially by the grenadiers of the army; it being a poſt of honour.

FORM, Forma, in *Phyſics*, denotes the manner of being peculiar to each body; or that which conſtitutes it ſuch a particular body, and diſtinguiſhes it from every other. Mr. Harris uſes the term form likewiſe in another ſenſe, as an efficient animating principle; to which he ſuppoſes Ovid to refer in the firſt lines of his Metamorphoſis.

"In nova fert animus mutatas dicere formas
Corpora——"

Theſe animating forms are of themſelves no objects either of the ear, or of the eye; but their nature or character is underſtood in this, that were they never to exert their proper energies on their proper ſubjects, the marble on which the ſculptor exerciſes his art would remain for ever ſhapeleſs, and the harp from which the harper calls forth ſounds would remain for ever ſilent.

Thus, alſo, the animating form of a natural body is neither its organization, nor its figure, nor any other of thoſe inferior forms, which make up the ſyſtem of its viſible qualities; but it is the power, which is yet able to produce, preſerve, and employ theſe. It is the power, which firſt moves, and then conducts that latent proceſs, by which the acorn becomes an oak, and the embryo becomes a man; by which digeſtion is performed in plants and animals, and, which departing, the body ceaſes to live, and its members putrify; and by which every being produces another like itſelf, and every ſpecies is continued. In animals, it is that higher faculty, which, by employing the organs of ſenſe peculiar to them as animals, diſtinguiſhes them as ſenſitive beings from vegetables; and it is alſo that more noble faculty, which by its own divine vigour, unaſſiſted perhaps with organs, makes and denominates him a being intellective and rational. So that Mr. Harris reckons two ſorts of forms, thoſe which are paſſive elements, and thoſe which are efficient cauſes. And all of them agree in this, that they give to every being its peculiar and diſtinctive character; and on the whole he concludes, that form appears in part to be an element, and in part an efficient cauſe, *i. e.* a cauſe which aſſociates the conſtituent elements of natural ſubſtance, and which employs them, when aſſociated, according to their various and peculiar characters. Harris's Phil. Arrangements, chap. vi.

The philoſophers generally allow two principles of bodies: matter, as the common baſis, or ſubſtratum of all; and form, as that which ſpecifies and diſtinguiſhes each; and which, added to a quantity of common matter, determines or denominates it this, or that; wood, or fire, or aſhes, &c.

Subſtantial forms ſeem to have been firſt broached by the followers of Ariſtotle, who thought matter, under different modes or modifications, not ſufficient to conſtitute different bodies; but that ſomething ſubſtantial was neceſſary to ſet them at a greater diſtance: and thus introduced ſubſtantial forms, on the footing of ſouls, which ſpecify and diſtinguiſh animals.

The conſiderations which the Peripatetics principally inſiſt on, in confirmation of this doctrine, are, 1. That, without ſubſtantial forms, all natural things would be of the ſame ſpecies, nature, and eſſence; which is ſuppoſed to be an abſurdity.

2. That every thing has its peculiar power, motion, and operation: as the magnet, *e. gr.* has that of attracting iron; but that this power does not flow from the matter of the body, which is only paſſive; nor from the accidents: and therefore that it muſt ariſe from a ſubſtantial form.

3. That without ſubſtantial forms, there would be no generation: for a production of accidents is only an alteration.

4. That without ſuch form, the nature of a man and of a lion would not differ.

What contributed much to their error, was the circumſtances of life and death: for obſerving, that, as ſoon as the ſoul was departed out of a man, all motion, reſpiration, nutrition, &c. immediately ceaſed, they concluded that all thoſe functions depended on the ſoul, and conſequently that the ſoul was the form of the animal body, or that which conſtituted it ſuch: that the ſoul was a ſubſtance, independent of matter, nobody doubted; and hence the forms of other bodies were concluded equally ſubſtantial.

But to this it is anſwered, that though the ſoul be that by which a man is man, and conſequently is the form of the human body, as human; yet it does not follow, that it is properly the form of this body of our's, as it is a body; nor of the ſeveral parts thereof, conſidered as diſtinct from each other. For thoſe ſeveral parts have their proper forms ſo cloſely connected with their matter, that it remains inſeparable therefrom, long after the ſoul has quitted the body: thus fleſh has the form of fleſh; bone of bone, &c. long after the ſoul is removed, as well as before.

The truth is, the body does not become incapable of performing its accuſtomed functions, becauſe the ſoul has deſerted it; but the ſoul takes its leave, becauſe the body is not in a condition to perform its functions.

The ancient and modern corpuſcular philoſophers, therefore, with the Carteſians, exclude the notion of ſubſtantial forms; and ſhew, by many arguments, that the form is only the modus or manner of the body it is inherent in.

And as there are only three primary modes of matter, *viz.* figure, reſt, and motion, with two others ariſing therefrom, *viz.* magnitude and ſituation, the forms of all bodies they hold to conſiſt therein; and ſuppoſe the variations theſe modes are capable of, ſufficient to preſent all the variety obſervable in bodies. See Mode.

Many varieties we actually ſee reſult from changes in theſe modes, which may very well paſs for differences of form: thus, an awl only differs from a needle in magnitude; a globe from a cube in figure; and tranſparent glaſs, being pulverized, will reflect the light, and appear white; and yet all the alteration conſiſts in the order and arrangement of the parts; when wheat is ground into flour, all the change conſiſts in a ſeparation of the contiguous parts; and when the flour is baked into bread, what is it but the ſame particles aſſociated again in another manner? By agitating water, a froth is formed; if the agitations be increaſed, the particles will exhale, and form clouds; which being congregated again, return in dew, ſnow, hail or rain; and the ſame water, by the acceſſion of cold, might have been formed into ice. So many different bodies, endued with different qualities, and which the Peripatetics themſelves allow ſpecifically different, ariſe from one and the ſame body, by mere motion and reſt!

The

The philofophy of fubftantial forms, its rife, ufe, and extent, are fet in an excellent light by F. Malebranche. But it is needlefs now to enlarge on this fubject. Forms are ufually diftinguifhed into *effential* and *accidental*. Though the five modes above mentioned, generally taken, be adventitious; yet, to this or that body, *e. gr.* to fire, or water, they are effential: thus, it is accidental to iron to have this or that magnitude, figure, or fituation, fince it might exift in different ones; yet, to a knife, or hammer, the figure, magnitude, and pofition of parts, which conftitute it a hammer, or knife, are effential, and they cannot exift, or be conceived without them. Hence it is inferred, that, though there be no fubftantial, there are effential forms, whereby the feveral fpecies of bodies become what they are, and are diftinguifhed from all others. *Accidental* forms are thofe really inherent in bodies, but in fuch manner as that the body may exift in all its perfection without them. Such as whitenefs in a wall; heat in water; a figure of a man in wax, &c.

Forms, again, are diftinguifhed into *fimple* and *compound:* the former are thofe of fimple bodies; *i. e.* of fuch as have but few properties: and the latter are thofe of more compound bodies; or of fuch as have more properties.

Thus, *e. gr.* if the form of a hard body be compared with the form of wood, the former may be accounted *fimple*, and the latter *complex:* inafmuch as a hard body, confidered only as hard, has fewer properties than wood. Abfolutely fpeaking, however, fimple forms are thofe of the elements; and compound, thofe of the mixt bodies.

Some diftinguifh forms into *natural* and *artificial*. *Natural* forms are thofe inherent in bodies, without any thing contributed thereto on the part of man. Such is the form of marble. Whereas *artificial* forms are thofe arifing from human induftry. Such is that of a ftatue. But this diftinction is ufelefs, and does not imply any intrinfic difference in the forms themfelves.

Others, again, diftinguifh forms into *primary* and *fecondary*. *Primary*, or *univerfal* forms are thofe which originally belong to phyfical and natural bodies; and thefe, they fay, are extenfion, figure, and organization; figure having refpect to its external, organization to its internal, and extenfion being common to both. *Secondary* forms are the fame fenfible qualities, and arife, for the moft part, from the primary forms. Harris's Philof. Arrangements. p. 88.

FORM is alfo ufed in the fame fenfe with clafs.

FORM alfo denotes the external appearance or furface of a body; or the difpofition of its parts, as to length, breadth, and thicknefs. In which fenfe it coincides with figure.

FORM is alfo ufed for a manner of being, or doing a thing according to rules; *e. g.* this republic has frequently changed its form of government; that is, its conftitution. Pardons generally exprefs a remiffion or abolition of a crime, in what form or manner foever it be committed. He was admitted doctor in form. Put your argument in form.

FORM, in *Hunting*, denotes the feat of a hare; or the place and time when and where fhe fquats.

FORM, in *Joinery*, &c. is applied to the long feats or benches in the choir of churches, for the priefts, canons, prebendaries, religious, &c. to fit on.

Du-Cange takes the name to be derived from hence, that the backs of the feats were anciently enriched with figures of painting and fculpture, called in Latin *formæ & typi*. In the life of St. William of Rofchild, we meet with forms as fignifying a feat for an ecclefiaftic, or religious, in a choir; and in that of St. Lupicin, we have *formula* in the fame fenfe. In the rule of the monaftery of St. Cæfaria, the nun who prefides over the choir is called *primiceria, vel formari.*

FORM, in *Law*, is applied to certain eftablifhed rules to be obferved in proceffes or judiciary proceedings. In which fenfe the word ftands oppofed to the ground or matter in difpute, or the merits of a caufe. Under this head we may obferve, that not only the fubftantial part, or judicial decifions of the law, but alfo the formal part, or method of proceeding, cannot be altered but by parliament; for, if once thofe outworks were demolifhed, there would be an inlet to all manner of innovation in the body of the law itfelf. The king, it is true, may erect new courts of juftice; but then they muft proceed according to the old eftablifhed forms of the common law.

Contra FORMAM *collationis, feoffamenti, et ftatuti.* See CONTRA.

FORM is alfo ufed, in the *Mechanic Arts*, for a kind of mould whereon a thing is fafhioned or wrought.

Such are the hatter's form, the paper-maker's form, &c.

The hatters' form is a large block or piece of wood, of a cylindrical figure; the top whereof being rounded, and the bottom quite flat. Its ufe is, to mould or fafhion the crown of the hat, after the matter thereof has been beaten and fulled. To form a hat, it is neceffary the wool, hair, &c. be very hot, juft reeking out of the copper. The paper-makers' form is the frame or mould wherein the fheets are fafhioned. See PAPER.

FORM, in *Mineralogy*. Mr. Wm. Martin, one of the lateft and beft writers on the extraneous foffils, organic remains or relics of the former race of animated beings and vegetables, of which we can now only find the veftiges in the ftrata of the earth, is of opinion, that it is the form only of fuch relics which can be taken into account in claffing them into genera and fpecies. See RELIQUIA.

FORM, in *Theology*, denotes one of the effential parts of the facraments, being that which gives them their facramental nature and efficacy.

The form confifts in certain words, which the prieft pronounces in adminiftering them. In fome of the Romifh facraments, the form is deprecative; in our's it is abfolute, or indicative.

The fathers and ancient divines held, that the facraments confifted of things and words, *rebus & verbis*. William of Auxerre was the firft who, about the beginning of the 13th century, introduced the terms *matter* and *form* in lieu thereof.

FORM *of Concord*, in *Ecclefiaftical Hiftory*. See CONCORD.

FORM *of a Series*, in *Algebra*. See SERIES.

FORM, *Syllogiftic*, in *Logic*, is a juft difpofition, both of the terms, in refpect of predicate and fubject; and of the propofitions, in refpect of quantity and quality.

By juft difpofition, we mean fuch an one, wherein the conclufion follows duly and legitimately from the two premifes, there being no form where there is no conclufion. See SYLLOGISM.

The difpofition of the feveral terms, being, as it were, fo many fteps or degrees of a fyllogiftic form, is called the *figure* of the fyllogifm.

The difpofition of the premifes alone, being, as it were another degree, is called the *mode* of the fyllogifm. See FIGURE and MODE.

FORM, in *Printing*, or *Printers' form*, is an affemblage of letters, words, and lines, arranged in order, and difpofed into pages, by the compofitor; from which, by means of ink and a prefs, the printed fheets are drawn.

Every

Every form is inclofed in an iron chafe, wherein it is firmly locked by a number of pieces of wood, fome long and narrow, and others in form of wedges.

There are two forms required for every fheet; one for each fide; and each form confifts of more or fewer pages, according to the volume of the book. See PRESS, and PRINTING.

FORM *of Corporeity*, according to Avicenna, and the Scotifts, is that which conftitutes body in the generical effe of body. That there is fuch a thing, they prove thus: the human body is a natural body, which cannot be placed in the effe of body, but by the form of corporeity: for it is either fo placed by this, or by the rational foul; not by the foul, fince that is fpiritual; therefore, by the form of corporeity. And the fame may be underftood of other bodies: but the later philofophers fet this afide as a chimera.

FORMA, MODO ET, in *Law*. See MODO.

FORMA *Pauperis*, or *in Forma Pauperis*, is when any perfon has a caufe or fuit, but is fo poor that he cannot difpend the ufual charges of fuing at law, or in equity.

In this cafe, upon his making oath that he is not worth 5*l*. his debts being paid, and bringing his certificates from fome lawyer, that he has juft caufe of fuit, the judge admits him to fue *in forma pauperis*; that is, without paying fees to the counfellor, attorney, or clerk. This cuftom has its beginning from ftat. 11 Hen. VII. cap. 12. See COSTS and DISPAUPER.

FORMAL, fomething that regards the form; or that gives the manner, or form.

The formal caufe joining itfelf to the material, produces the body or compound.

The fchoolmen alfo apply the word to any thing which has a kind of form, either effential or accidental, at leaft, in our conception. Thus we frequently hear the philofophers talk of the formal object of knowledge; and of the formal reafon of any thing; formal unity, &c.

FORMAL *Caufe* is defined, by certain philofophers, to be fomething implanted in one parcel of matter, whereby it is diftinguifhed from all other matter.

For matter is fuppofed common to all bodies: confequently, that they are diftinguifhable from one another, does not arife from their matter, but from the form which is peculiar to each: hence, what is produced by fuch caufe, is faid to be formal.

FORMAL *Circle*. See CIRCLE.

FORMAL *Notion*. See NOTION.

FORMAL is alfo ufed in a moral fenfe, importing pofitive, exprefs, and precife.

Thus we fay, a formal agreement, a formal text, formal anfwer, &c. Formal evidence, fee EVIDENCE.

FORMALITER, FORMALLY, is varioufly ufed in the fchools.

Sometimes it is underftood of the fubject, when a predicate is therein on account of fome form: thus, white, formally taken, diffufes light; *q. d.* the form inherent in this fubject, *viz.* whitenefs, is the caufe why the fubject difperfes the light.

FORMALLY has alfo place in fuppofitions; a word being formally fuppofed, when it is taken for the thing it was intended to fignify: as, *man is an animal*.

FORMALLY is alfo ufed in the fame fenfe with adequately and totally; thus, a fyllogifm formally, *i. e.* adequately taken, requires three propofitions.

FORMALLY is alfo ufed for really, in oppofition to objectively; thus, a thing is faid to be formally fuch, when it is fuch in the proper notion of the thing fpoken of.

FORMALLY, again, is ufed in fpeaking of the manner wherein a thing is contained in another, in oppofition to virtually and eminently.

FORMALITY, the quality of a form or formula; or that which conftitutes and denominates them fuch.

FORMALITY, as defined in the *Schools*, is any manner, wherein a thing is conceived; or, a manner in any object, importing a relation to the underftanding, whereby it may be diftinguifhed from another object.

Thus, animality and rationality are formalities. The Scotifts make great ufe of formalities, in oppofition to the virtualities of the Thomifts.

The Scotifts hold, that the metaphyfical degrees in man are fo many formalities, really diftinct from each other; as *man*, *living*, *animal*, &c. And the fame they hold of the attributes of God. The Thomifts, on the contrary, contend that they are really and intrinfically the fame.

FORMALITIES, in *Matters of Law*, are frequently ufed for the formulas themfelves, or the rules prefcribed for judiciary proceedings. In contracts of ftrict law, all the formalities muft be ftrictly obferved; and omiffion of the leaft formality may ruin the whole convention.

The term is alfo ufed for a certain order, or decorum to be obferved.

FORMARTEN, in *Geography*, one of the four diftricts into which Aberdeenfhire in Scotland was formerly divided; the other three being Mar, Buchan, and Gariock. Formarten extends along the coaft from the river Don to the Ythan, and on the weft is bounded by a ridge of low hills near Old Meldrum, which feparate it from Gariock. It confifts partly of a ftony foil, interfected with bogs, and partly of an excellent clay, capable of a high degree of improvement.

FORMATION, in *Geology*, is a term much in ufe with the difciples of Werner, and other German geognoftics, and fignifies ftrata or maffes of ftone, following each other in an uninterrupted order or feries, and fuch as may have been formed by the fame agent, and under a fucceffion of fimilar circumftances. This term feems generally ufed fynonymoufly with ftrata, or depofitions of matter, but fometimes fignifies the particular ftructure of mountains or large maffes of particular kinds of minerals. See GEOGNOSY.

FORMATION, in *Philofophy*, &c. the act of forming, fafhioning, or producing a thing.

FORMATION *of Stones*. See STONES.

FORMATION *of the Tails of Comets*. See COMETS.

FORMATUM PUNCTUM. See PUNCTUM.

FORME', or FORMY, in *Heraldry*. A crofs formé, or formy, is a crofs narrower in the centre, and broad at the extremes: fo called by Leigh and Morgan, though moft other authors call it *patée*.

FORMED, or FIGURED *Stones*, among *Naturalifts*, are fuch bodies as, being either pure ftone, flint, or fpar, are found in the earth, fo formed, as that they bear a near refemblance to the external figure of mufcles, cockles, oyfters, or other fhells, or to plants, or animals.

Authors have been greatly divided as to their origin: the feveral opinions fee under the articles FOSSIL, SHELL, &c.

FORMED *Bachelor*. See BACHELOR.

FORMED, in *Heraldry*, the fame as feated.

FORMEDON, *Secundum Formam Doni*, in *Law*, a writ which lies for him who has a right to lands or tenements by virtue of an entail arifing from the ftatute "de donis" of Weftm. 2. 13 Edw. I. cap. 1. This is in the nature of a writ of right, which is confined only to fuch as claim in feefimple;

ſimple; and it is the higheſt action the tenant in tail can have. Finch. L. 267. Co. Litt. 316.

The time of limitation in a formedon, by ſtat. 21 Jac. I. cap. 16. is twenty years; within which ſpace of time, after his title accrues, the demandant muſt bring his action, or elſe is for ever barred.

There are three kinds, *viz. forma donationis*, or *formedon in the deſcender; formedon in the remainder;* and *formedon in the reverter.*

Formedon *in the deſcender* lieth, where a gift in tail is made, and the tenant in tail alienes the lands entailed, or is diſſeiſed of them, and dies; in this caſe, the heir in tail ſhall have this writ, to recover thoſe lands ſo given in tail againſt him who is then the actual tenant of the freehold. F. N. B. 211, 212.

Formedon *in the remainder*, lies where a man gives land to another for life or in tail, with the remainder to a third perſon in tail or in fee; and afterwards the former tenant dies without iſſue inheritable, and a ſtranger intrudes upon him in remainder, and keeps him out of poſſeſſion. F. N. B. 217. In this caſe, he in remainder ſhall have this writ, in which the whole form of the gift is ſtated, and the happening of the event upon which the remainder depended. This writ is not given in expreſs words by the ſtatute "de donis;" but is founded upon the equity of the ſtatute, and upon this maxim in law, that if any one hath a right to the land, he ought alſo to have an action for the recovery of it.

Formedon *in the reverter* lies where there is a gift in tail, and afterwards by the death of the donee or his heirs without iſſue of his body the reverſion falls in upon the donor, his heirs or aſſigns; in ſuch caſe the reverſioner ſhall have this writ to recover the lands, wherein he ſhall ſuggeſt the gift, his own title to the reverſion minutely derived from the donor, and the failure of iſſue upon which his reverſion takes place. F. N. B. 219. 8 Rep. 88. This lay at common law before the ſtatute "de donis," if the donee aliened before he had performed the condition of the gift, by having iſſue, and afterwards died without any. Finch. L. 268.

FORMELLA, a certain weight of about ſeventy pounds, mentioned in the ſtatute of weights and meaſures, 51 Hen. III.

FORMELLO, in *Geography*, a town of Italy; 10 miles N.W. of Rome.

FORMENTARA. See Fromentera.

FORMENTOR, Cape, the N.E. point of Majorca. N. lat. 39° 57'. E. long. 3° 13'.

FORMER, in *Gunnery*, for cartridges, conſiſts of a piece of wood, either cylindrical or flat, according to the ſize of the cannon, &c. for which it is to be employed, or for the material whereof the cartridge is to be made. For making ſmall cartridges of paper, ſuch as are ſuited to muſkets, carabines, piſtols, &c. a cylindrical former of a proper diameter, and about a foot in length is neceſſary; this ought to be made of lignum vitæ, or heart of crab-tree, or ſome ſuch very ſolid wood, turned perfectly ſmooth, and armed at its ſummit or upper extremity with a ſtout braſs or copper ferril. The other extremity is either flat or concave, according as the cartridges are to be made either *blank* (*i. e.* light) or *heavy* (*i. e.* with a ball in each). When blank cartridges are to be made, the flat-ended former is to be uſed, the paper being wrapped round, under the guidance of a turned ring or groove, to keep it to a proper height; when the end being properly lapped over in regular folds, is placed downward on a board, and the former, ſtanding perpendicularly, is ſtruck ſeveral times forcibly with a mallet; ſo that the laps of the paper may be fixed in their ſituations, and not be liable to open when the cartridge caſe may be taken off the former to be handed over to thoſe whoſe duty it may be to pour into each the allotted quantity of gunpowder.

Heavy, that is, ball-cartridges, are made with a former, of which the lower extremity is nearly ſemi-ſpherically concave, ſo as to allow the ball to fit in while the paper is paſſed round. That being done, a piece of fine, but tough twine is paſſed in a double hitch over the paper, cloſe to the ball, and drawn very tight; thus ſecuring the ball from falling out, and enabling it to retain the gun-powder. When properly managed, the end of the paper will form an inverted cup, of which all but about the third of an inch ſhould be cut away with a pair of ſciſſars; when the former, being as before placed perpendicular on the board, and ſtruck with the mallet, the cup will be flattened, at the ſame time that the ball is ſettled cloſe down to the ligature; the former may then be withdrawn.

The former for a cartridge of any ſize, when made with paper, may be on the ſame principle, the ſize being ſuited to the nature of the piece for which the cartridges may be preparing.

When woollen cartridge-caſes are to be made, a flat former, not unlike a taylor's ſleeve board, is needful; the width of the former being proportioned to the calibre of the cannon, and its length according to the uſe to which it is to be put: thoſe for ſalutes, &c. wherein ſmall charges of powder are required, being leſs capacious than ſuch as are intended for ſervice, but eſpecially for battering in breach. The following lengths of cartridges will ſerve to ſhew the requiſite lengths of the ſeveral formers; obſerving that one end is at right angles with the two ſides, which of courſe are parallel, and, that the other is ſemi-circular: the edges are every where duly rounded off.

Table for the lengths of formers for the cartridges uſed in cannon.

Nature of the piece of Ordnance.		Paper. Feet.	Inches.	Flannel. Feet.	Inches.
Pounders	42	2	4	2	3
	32	2	4	2	3
	24 heavy	2	4	1	10
	— med.	2	4	1	5
	— light	2	4	1	0
	18	2	4	2	3
	12 heavy	2	4	1	6
	— med.	2	4	1	2
	— light	2	4	0	10
	9	2	4	1	4
	6 heavy	2	0	1	1
	— med.	2	0	0	11
	— light	2	0	0	$9\frac{1}{2}$
	4	1	7	0	5
	3	1	7	0	4
Mortars	13 Inch	—		1	6
	10	—		1	1
	8	—		1	0
	$5\frac{1}{2}$	—		0	9
	$4\frac{2}{5}$	—		0	7
Howitzer	8	—		1	$1\frac{1}{2}$
	$5\frac{1}{2}$	—		0	$9\frac{1}{2}$
	$4\frac{2}{5}$	—		0	$9\frac{1}{2}$

FORMERY, in *Geography*, a town of France, in the department of the Oiſe, and chief place of a canton in the diſtrict of Beauvais; 9 miles N.W. of Gerberoy. The place

place contains 1,433, and the canton 10,050 inhabitants, on a territory of 220 kiliometres, in 24 communes.

FORMEY, John Henry Samuel, in *Biography*, was born at Berlin in 1711. His family was originally of Champagne, and his father was a refugee on account of his religious principles, at the revocation of the edict of Nantes. He was educated at the royal French college for the church, and was ordained minifter before he had completed his twentieth year. He was chofen one of the officiating minifters of the French congregation in Berlin; in 1737 he was appointed profeffor of eloquence in the French college, and in 1739 fucceeded to the philofophical chair of the fame college. On the reftoration of the Royal Academy of Sciences and Belles Lettres at Berlin in 1744, M. Formey was made fecretary to the philofophical clafs, and four years afterwards, at the inftance of the prefident Maupertuis, he was created fole and perpetual fecretary of the academy, which poft he held nearly fifty years. He was admirably qualified for the office, and fo was regarded by foreigners as well as by his own countrymen. He was accordingly affociated to a number of foreign learned bodies, as thofe of London, Peterfburg, Haarlem, Mantua, Bologna, and many others in Germany, and he was perfonally acquainted with feveral of the moft eminent and illuftrious characters throughout Europe. Befides his academical employments, he had the management of various other concerns. He was agent or fecretary to the dowager princefs of Wirtemberg: he filled feveral offices in the French colony at Berlin, and at length became a privy counfellor in its fuperior directory. He was twice married, and by his fecond wife had many children, feven of whom furvived him. He died in the month of March 1797, at the great age of eighty-five years and eight months. The printed works of M. Formey were fo numerous, that he is faid to have been in connection with fifty bookfellers. There is fcarcely a department in the fields of fcience and literature which he had not cultivated; and his early occupation as a journalift, which he began in 1733 with Beaufobre in the Bibliotheque Germanique, had given him a very extenfive acquaintance with books on all fubjects. In theology, he wrote "Le Philofophe Chretien:" he defended the caufe of revelation againft Diderot and Rouffeau. He took an active part in the Encyclopædia of Yverdun, and wrote various popular pieces on morality, and elementary works for young people. As a member of, and contributor to the academy, he read a number of memoirs, as well on popular as on high philofophical fubjects, fuch as the doctrines of liberty and neceffity: the demonftration of the exiftence of a God, &c. In all thefe there are a clearnefs and precifion, an eafy and flowing ftyle, and a freedom from that dogmatifm which is very difgufting when affumed upon fubjects of fo much doubt and difficulty. Gen. Biog.

FORMIÆ, in *Ancient Geography*, a town of Italy, in Latium, N. of Capua, and W. of Minturna. Mola di Gæta was built on its ruins. Some have fuggefted that it was founded by the favage people called Leftrigones; however this be, it was very confiderable in the time of the Romans. Horace calls it "Mamurrarum Urbs," from the name of a diftinguifhed family which dwelled in or near it. Near this town was the country-houfe of Cicero, called his "Formianum," and not far from hence he was affaffinated by the emiffaries of Antony. (See Cicero.) The place in which this atrocious deed was perpetrated was difcovered by the Abbé Chaupy by means of a monument which he found on a private road that led to the fea, whence Cicero meditated his efcape. Horace compares the wine made from the grapes of the Formian hills with the Falernian.

FORMIATE. See Formic *Acid*.

FORMIC Acid, in *Chemiftry*, fo denominated from the infect from which it is obtained. Chemifts are not unanimous in their opinion refpecting this acid; fome of them contend that it is no other than the acetic or malic acid, and others maintain that its properties are diftinct from thofe of all other acids, and therefore that it is an acid *fui generis*. It was noticed nearly a century and half ago in the Philofophical Tranfactions by Mr. Ray, who gave an account of the experiments of Mr. Fifher on the acid juice which is given out fpontaneoufly by ants, and which they yield when diftilled. Since that period many experiments have been made by Margraff, Richter, Deyeux, Fourcroy, Vauquelin, and others; of whom the laft two concluded that the formic acid was a mixture of the acetic and malic acids. Suerfen was induced to examine the fubject with much attention, and from his experiments in 1804, he inferred that formic acid contains no malic acid, and that its properties are very different from the acetic. This chemift had recourfe to the method propofed by Margraff, and corrected by Richter to obtain the formic acid pure. He infufed a quantity of red ants, *formicæ rufæ*, in thrice their weight of water, and put the mixture in a filver ftill; drew off the water by diftillation, till a burnt fmell began to be perceived; he then faturated the water in the receiver with pot-afh, and evaporated to drynefs. The mafs thus obtained was mixed with as much diluted fulphuric acid as was fufficient to faturate the potafh, and diftilled to drynefs in a retort. The liquid, which came over, was again rectified by moderate heat to get rid of any remaining portion of fulphuric acid; and the refult was fuppofed to be pure formic acid. It is colourlefs like water; its fmell is peculiar to itfelf, and different from that of acetic acid; its tafte is acid; it reddens vegetable blues; and fo alfo will the juice which is given out fpontaneoufly by the infect in paffing over the corollæ of blue flowers. The fpecific gravity of formic acid is 1.11, whereas the moft concentrated acetic acid is only 1.08. It is not fufceptible of being brought to a ftate of cryftals, and it will not neutralize fo large a quantity of alkali as the acetic acid. This acid flies off in the form of vapour; fmelling fomething like mufk; deftroys animal life under the gafeous form; is capable of ferving economical purpofes like vinegar; is decompofed by great heat, and forms falts with earth in alkalies and metallic oxyds, which are cryftallizable and not deliquefcent. Thefe have been denominated formiates by thofe who admit the formic as a diftinct acid, but by thofe who oppofe this theory the formiates are fuppofed to be compounds of the acetates and malates together, with a portion of animal matter, the nature of which is not perfectly known. The quantity of acid contained in ants exceeds what is found in any other known part of the animal creation. Thefe infects exhale the acid whether irritated or not, fo that the fame changes, produced on flowers by known acids, take place when they are laid in the tract of ants, and it has been conjectured that part of the irritation caufed by their bite is produced by the infertion of a portion of their native acid.

FORMICA, in *Entomology*, a genus of the hymenopterous order, poffeffing, according to Linnæus, the following effential character: a little upright fcale between the thorax and the abdomen; males and females furnifhed with wings, and the neuters apterous, or winglefs.

Geoffroy propofes in addition to the above character, to diftinguifh

diſtinguiſh the inſects of this genus from the ſtructure of the antennæ, theſe, as he obſerves, being in the true formicæ, elbowed or broken into an angle in the middle, and having the firſt joint longer in proportion than the others; the ſtemmata or falſe eyes three in number, and the abdomen joined to the thorax by means of a ſhort pedicle, or ſtalk.

This character is further improved by Schæffer, who deſcribes the formicæ as having the mouth armed with jaws, the wings incumbent, and the tarſi compoſed of five articulations.

Fabricius defines the genus with ſtill more preciſion, from the ſtructure of the organs, or parts which compoſe the mouth; according to this author, the feelers are four in number, unequal, with cylindrical joints placed at the tip of the lip, which is cylindrical, and almoſt membranaceous, and the antennæ filiform.

In the Gmelinian edition of the Syſtema Naturæ, the Fabrician definition is united with that before aſſigned to the genus formica by Linnæus.

La Marck explains the genus ſomewhat differently, and by the adoption of his character, ſeveral of the Linnæan and Fabrician formicæ are excluded. This writer lays down the eſſential character as follows; antennæ filiform and broken, the firſt joint very long; feelers unequal, the anterior pair longer; mandibles ſtrong; tongue ſhort, concave and truncated. To this is added, as a ſecondary character, that the abdomen is attached to the corſelet by a pedicle, bearing a ſmall ſcale, or vertical knob; and that of each ſpecies there are three kinds, males, females, and neuters, which latter are without wings. The larva deſtitute of feet.

It will not be amiſs in this place to remark that the ſpecies of formicæ known to Linnæus, or at leaſt deſcribed by that naturaliſt, do not amount to twenty, a number nearly doubled by Fabricius in his "Species Inſectorum," as he there deſcribes altogether thirty-ſeven; and this number has been again progreſſively augmented in his later publications to about ninety ſpecies. Thus it will be perceived that Fabricius and not Linnæus is the firſt deſcriber of the far greater number of thoſe ſpecies which are inſerted in the laſt edition of the Syſtema Naturæ, and it muſt be at the ſame time obſerved that it is principally to his labours we ſtand indebted for our knowledge of thoſe kinds which are peculiar to extra-European climates.

Since the time of the above writers, the hiſtory of this curious tribe of inſects has engaged the attention of other continental entomologiſts, among the principal of whom we ſhould mention Latreille. This author deſcribes only a few new ſpecies, yet he enters more minutely on the ſubject of claſſification in this family than either of his predeceſſors. From the reſult of his obſervations it appears neceſſary to divide the formicæ of Linnæus and Fabricius into two, if not a greater number of genera, and beſides that to form ſeveral ſubdiviſions of thoſe which ought to be retained under the original deſignation of formica. The moſt obvious diſtinction conſiſts in the diſſimilar ſtructure of the antennæ, theſe in one tribe terminating in a maſs or club, and being in the other nearly ſetaceous; in the latter the firſt joint is very long, the ſecond almoſt conic, and the laſt of the ſame bulk as the foregoing, or rather leſs. The inſects which compoſe this ſection are further diſtinguiſhed by other characters, which ſeem to concur in forming a natural line of ſeparation between the two genera, the moſt material of which appears however to conſiſt in the ſtructure of the antennæ.

Latreille at one time propoſed to comprehend the firſt mentioned tribe as a diſtinct genus under the name of cryptocerus, allowing the others to remain under the original appellation of formica. In an arrangement ſubſequently publiſhed by the ſame author, he retains the whole as one family, which he calls formicariæ, and under this is included no leſs than eight genera. The ſpecies of formicæ, herculanea, rufeſcens, hæmatoda, clavata, hamata, and cephalotes are conſidered generically diſtinct from each other, and are referable to the ſeveral newly inſtituted genera of Latreille in the following order; herculanea, with 4-punctata, and rufa, belong to the genus formica; rufeſcens to polyergus; hæmatoda to odontomachus; clavata to ponera; hamata and guloſa to eciton; and cephalotes with rubra to myrmica; the two remaining genera of this family are cryptocerus and dorylus. Several of theſe genera are ſubdivided into two or more ſections, which altogether render the arrangement rather more diffuſe than will be deemed perhaps in any manner requiſite by other naturaliſts.

The formicæ are called among us piſmires, ants, or emmits. They live, for the moſt part, in large ſocieties; are proverbially an induſtrious race of creatures; and, like the bees, their ſpecies are invariably compoſed of three kinds, the males, females, and neuters. The different ſpecies are diſperſed throughout every part of the known world: many inhabit woods, where they eſtabliſh themſelves in immenſe colonies, in the trunks of decayed trees, or in deep ſubterranean cavities, which they either conſtruct for themſelves, or ſeize from others; for colonies of ants are frequently met with in cavities of the ground, which are known to be the burrows of rats, rabbits, and other quadrupeds, whoſe habitations theſe troubleſome intruders have probably rendered untenable to the original occupiers. Some form their neſts in the earth, beneath the ſhelter of a heap of ſtones, or under a tree, among the ramifications and branches of the root; while others occupy the more open places, in the fields or plains, and ſo contrive their habitations that the ſummit riſes in a cone or hillock, which we call an ant-hill, to the height of one, two, or three feet; and in hot climates, even more above the ſurface of the ground. There are ſpecies which in a ſimilar manner form neſts in the ſands; but theſe are not numerous. The interior of theſe neſts is generally ſpacious, and adapted for the reception of thoſe myriads of creatures which compoſe each diſtinct ſociety. Thoſe which reſide in trees provide themſelves with an habitation, by ſelecting ſuch as are already rotten, and excavating the interior to the dimenſion required. Others, and thoſe in particular which live in the hillocks, conſtruct the walls of their cones with dry vegetable ſubſtances, ſuch as the leaves of fir trees, and other evergreens, dried tendrils, twigs, and ſtalks, or other ſimilar materials, intermixed with earth and clay. The interior exhibits a number of apartments or paſſages, the middle one of which may be conſidered the principal, as being the nurſery for the larvæ or young; other parts are allotted to the males and females; and the more open ſpaces to the neuters.

The conſtruction of theſe neſts, in common with every other laborious occupation, is the buſineſs of the neuters, as among the bee-tribe. While the latter are employed in drudgery, in providing the ſociety with a ſufficient ſtock of proviſion, and in the various toil incidental to the feeding and rearing the young, the females ſit in inactivity, and never quit the neſt, except to indulge in the ſofter paſſions with the males. Linnæus believed their amours were conducted within the neſt, an idea contradicted by the more

recent obfervations of other naturalifts. On this occafion they leave the neft, and under favour of the darknefs which a fummer evening affords, retire to a fhort diftance, whither the males follow; and in fuch fituations the ants are frequently feen covering the ground in pairs for a pretty confiderable fpace. The feafon of coupling varies in different fpecies from the beginning of fummer to the end of autumn.

After this union of the fexes, the males die, or at leaft never return to the neft; the females, on the contrary, either return of their own accord, or are carried thither by the working ants, and are attended with the utmoft care and tendernefs. The eggs they depofit are conveyed to their proper receptacle, and, when hatched, become the objects of their deepeft folicitude. The eggs are fmall, roundifh, and of a yellowifh-white colour. The larvæ are white, thick, and fhort, and their body compofed of twelve rings. In the nymph or pupa ftate, thofe ants, which when produced will be deftitute of a fting, are entirely naked; while the others are enveloped in a filken cone. The females are much larger than the males.

The working ants wander about all day in fearch of food, or materials for the neft; and affift each other, when the load is too heavy for one or more that have attempted to move it. The eggs and larvæ are daily brought out of the neft by them, and expofed to the warmth of the fun; and the larvæ fed till they affume the pupa form. When in fearch of provifion, they will not fcruple to attack any infect, however confiderable in fize, and, by their united ftrength, have little difficulty to overcome their victim. They alfo attack and devour fmall quadrupeds, birds, and reptiles, when they find them in a helplefs ftate, incapable of defending themfelves; and which, in the end, muft be confidered as the fate of many. In fhort, they prey on food of every kind, whether animal or vegetable. Some fpecies are, however, moft injurious to the former, and others to the latter; though, when preffed with hunger, they devour either indifcriminately.

In the evening, when their labour is over, the ants are faid to make their repaft of whatever provifion they have collected in the courfe of the day; for their care and forefight, in laying up a ftore of provifion againft the winter, are no other than pleafing fictions, which, however they amufe the fancy, have no exiftence in reality. During the winter, they either become torpid or die. The ants are particularly fond of the aphides, or lice which infeft plants; and are, in their turn, the favourite food of birds and various other animals.

Ants fwarm in every region of the globe. In northern countries, and more efpecially thofe which abound in woods, thefe infects are exceedingly troublefome. The ravages of thefe creatures are not, however, to be compared with thofe of the ant-tribe which inhabit warmer climates. The latter are oftentimes the fcourge of thofe countries which they inhabit. In Africa it is well known that provifion of every defcription, and even clothes and various articles of furniture, are oftentimes deftroyed by thefe creatures. The American iflands fwarm with them, as well as Africa, and South America. The damage occafioned by the ants, in the fugar plantations of Grenada, about the year 1777, affords a memorable proof of the tremendous powers which thefe apparently infignificant creatures poffefs to do mifchief: it was fo exceffive, that it was deemed expedient to burn down the whole of the ftanding crops of canes, and turn up the earth throughout the plantations, in order to deftroy thofe ants which had fixed their habitations in the canes, and at their roots. Thefe were to be replaced by new crops: and if that remedy proved ineffectual, it was determined to abandon the culture of the canes altogether. After fuftaining confiderable lofs, and having in vain endeavoured by every means to exterminate the legions of ants with which the country was infefted, without reforting to this final remedy, the inhabitants were, however, at length very fortunately relieved by the fetting in of very heavy rains, which checked the ants in their career of devaftation, and deftroyed immenfe numbers of them. The ants in thofe parts are always numerous; but, on this occafion, they appeared fuddenly in fuch bodies, that nothing could refift them. The country, in many parts, was literally covered for the fpace of miles with them. They defcended the hills in torrents; the plantations were every where filled with them, as well as every road and avenue leading to them. Numbers of the domefticated quadrupeds perifhed. Rats, mice, and reptiles of every kind, became an eafy prey to them; and even the birds, which they attacked wherever they alighted, till they were fo haraffed as to fall at laft within their power. Streams of water retarded their progrefs only for a fhort time: the foremoft columns pufhing boldly into the water to certain death, and there perifhing, formed at length an embankment, which dividing the waters, afforded means for the reft to pafs over in fecurity. Even fire itfelf, which will oftentimes deter the moft ferocious beafts of prey in their attacks, was in vain employed on this occafion. Fires were lighted in the routes which, from their courfe along the hills, it was obvious they would purfue; nor did this divert their track: they precipitated themfelves into the fires in fuch bodies as to extinguifh them; and though many by this means perifhed, the reft were enabled to continue their march unhurt.

The appearance of the ants in lefs formidable bodies is indeed efteemed rather a benefit than difadvantage, in thofe countries; becaufe they affift, and in a very material degree, in the deftruction of fnakes, and other venomous reptiles, when they can feize on them by furprife. We are affured by Mad. Merian, that the fpecies cephalotes is called in Surinam the ants of *vifitation*, as they appear only at certain feafons, or about once in two or three years. Its multitudes receive a cheerful welcome from the natives, who throw open the doors of their houfes to admit them; the ants enter, traverfe every part of their dwellings, and, after deftroying the rats, mice, fcorpions, kakerlacs, or cockroaches, and other vermin fecreted therein, again take their departure.

Ants may be eafily killed by means of arfenic, kneaded with provifion of any kind, and which being thrown into the neft, will be greedily confumed by them. The fting of the ant is very fharp and painful, the fevere fenfation of which may be abated by the application of a mixture of oil and honey. Such ants as poffefs no fting are, neverthelefs, capable of exciting a painful puftule, by means of an acrid juice which they difcharge upon the fkin: this juice proceeds from the mouth, contrary to the vulgar fuppofition that it is emitted from the vent; and the pain occafioned by which may be abated by an application of oil and honey, as before mentioned.

A very grateful acid is procured from ants by diftillation. See Formic *Acid*.

The ants are probably more numerous, in refpect to fpecies, than we are at prefent aware: the following appear to be the moft material of thofe already defcribed.

Species.

Herculanea. Black; abdomen ovate; legs ferruginous.

ginous. Linn. Fn. Suec. *Formica magna*, ib. *Formica magna hyppomyrmex*, It. Goth. *Formica maxima*, Ray.

Large; lives in the trunks of decayed trees in Europe.

Compressa. Black; thorax compreffed; tip of the antennæ and thighs rufous; head very large. Fabr.

Native of Tranquebar. The abdomen is ovate; the fcale entire; thorax immaculate.

Smaragdina. Green; thorax lineated with yellow. Fabr.

Inhabits India, and is of a large fize; the antennæ reddifh at the tip; wings large and white, with ferruginous nerves.

Rufipes. Hairy, black; legs rufous. Fabr.

Defcribed from the Bankfian cabinet. The head is large, ovate, rough with ferruginous hairs; antennæ brown at the tip; fcale of the petiole ovate-obtufe.

Bicolor. Black; fcutel, abdomen, and legs ferruginous. Fabr.

Large; inhabits Barbary.

Erythrocephala. Deep black; head rufous; fcale of the petiole double. Fabr.

Native of New Holland. The head large and oblong; antennæ rufous; thorax filiform; legs black, at the ends rufous.

Barbara. Deep black; head, antennæ, and ends of the legs ferruginous; petiole with two tubercles. Fabr.

Inhabits Africa; fize that of herculanea; head large; firft joint of the antennæ large, and black.

Didyma. Black; abdomen greyifh; fcale of the petiole double. Fabr.

An European fpecies found chiefly in Italy. The fize is moderate; antennæ pitchy; thorax gibbous; abdomen covered with cinereous down; fcale double, or widely emarginate; legs black.

Viatica. Ferruginous, abdomen ovate and black. Fabr.

The mandibles are blackifh at the tip; thorax compreffed, ferruginous with a fingle tubercle; hind legs very long with brown fhanks. This fpecies inhabits Spain, and is the fame fize as the laft.

Pallipes. Deep black and gloffy, antennæ and legs whitifh. Fabr.

Small; head fmall and roundifh; thorax gibbous; fcales of the petiole truncated, and nearly emarginated; wings white. Native of Cayenne.

Ægyptiaca. Black; thorax rufous, two-toothed behind; petiole with two tubercles. Fabr.

Head large, and brown; antennæ ferruginous; thorax compreffed; legs ferruginous with fub-clavated thighs; a fmall fpecies found in Egypt.

Binodis. Black; head very large and rufous; petiole of the abdomen bituberculated. Fabr.

Native of Egypt; legs rufous; thighs ferruginous.

Rufa. Black; thorax compreffed, and with the legs ferruginous. Fabr. Thorax compreffed, entirely ferruginous, head and abdomen black. Linn.

Inhabits Europe.

Pubescens. Black; abdomen pubefcent. Fabr.

Native of Calabria and Hungary. In fize refembles the laft.

Nigra. Gloffy-black; tail piceous. Degeer.

An European infect.

Fusca. Greyifh-brown and polifhed; antennæ and legs ferruginous; wings white. Degeer.

Inhabits Europe.

Flavescens. Yellowifh; abdomen darker, with a black dorfal line. Fabr.

Native of Cayenne. In this fpecies the fcale of the petiole is entire.

Melanocephala. Pale; head and back of the thorax black. Fabr.

Like the laft this infect inhabits Cayenne; it occurs in immenfe numbers at certain feafons, and commits vaft depredations, confuming and deftroying every kind of provifion.

Rubra. Teftaceous; eyes and dot under the abdomen black. Degeer.

An European fpecies.

Cinerascens. Black; head rufous; abdomen greyifh. Fabr.

A large fpecies found in Tranquebar; the head is rufous, mandibles and antennæ black; abdomen ovate, greenifh-grey, with a black angle behind the middle; wings dufky.

Foetens. Oblong, black; tail rufous; fcale of the petiole fomewhat cylindrical and obtufe. Fabr.

Named fœtens, from its offenfive fmell; the fpecies is of a large fize, preys on other ants, and inhabits Guinea.

Elongata. Oblong, rufous; abdomen and legs paler. Fabr.

A ferocious fpecies found in Tranquebar; the head is large, mandibles black; thorax elongated and compreffed; fcale forming an ovate tubercle in the middle of the petiole.

6-Guttata. Oblong, black; abdomen with three dots each fide; antennæ and legs rufous. Fabr.

Inhabits Santa Cruz; the mouth is rufous; fcale ovate, obtufe and entire; wings whitifh, with a marginal black fpot.

Albipennis. Oblong, pale; thorax black behind; abdomen reddifh. Fabr.

Inhabits fame country as the former; the fcutel is white; fcale of the petiole ovate, gibbous; wings white with a black marginal dot.

Rufibarbis. Oblong, black; mouth and thorax rufous. Fabr.

Native of France.

Obsoleta. Above black; beneath red, teftaceous; abdomen fub globular. Fabr.

Lefs than Formica rufa, and inhabits Europe.

4-Punctata. Thorax compreffed and ferruginous; abdomen black, with four fnowy dots. Fabr.

Inhabits Alface. The head is black; antennæ ferruginous; fcale of the petiole fhort, obtufe; legs ferruginous, thighs black.

Virescens. Pale; head and abdomen greenifh. Fabr.

Defcribed from the Bankfian cabinet. The petiole is long, with a fmall raifed tubercle. This infect inhabits New Holland.

Saccharivora. Black; antennæ, mandibles, and legs rufous. Brown Jam.

A native of the American iflands; and is very deftructive to the fugar-cane, in which it forms its neft.

Maculata. Black; pofterior part of the thorax and thighs ferruginous; abdomen with pale fpots at the fides. Fabr.

Inhabits Africa; the head is large; mandibles with many teeth; antennæ piceous at the tip; abdomen ovate and hairy.

Antiguensis. Teftaceous; abdomen black at the tip, the petiole with two tubercles. Fabr.

Native of Antigua.

Guineensis. Ferruginous; abdomen black; legs yellowifh. Fabr.

A fmall

A fmall fpecies found in Guinea.

Omnivora. Thorax rough, with raifed dots; petiole with two tubercles; body teftaceous; abdomen very minute. Degeer.

Native of Surinam.

Flava. Yellow; abdomen ovate and pubefcent. Degeer.

An European fpecies.

Caespitum. Black; petiole of the abdomen with two tubercles; fcutel bidentated. Linn.

In dry meadows under mofs in Europe; the winged ants of this fpecies fly abroad in fwarms like the day-fly, when the weather is ferene.

Tuberum. Rufous; head black; abdomen with a black band, the petiole with two tubercles. Fabr.

Inhabits Sweden; lefs than the former; the antennæ black at the tip, and the thorax bidentated behind.

Vagans. Rufous; head, and back of the abdomen brown; thorax two-fpined behind; petiole with two tubercles. Fabr.

Twice the fize of the former; the head globular; antennæ ferruginous. This fpecies inhabits Saxony.

Acervorum. Rufous; head and abdomen black; thorax two-fpined behind; petiole with two protuberances. Fabr.

Refembles the laft; the antennæ and mandibles rufous; legs ferruginous.

Native of Denmark.

Unispinosa. Black; antennæ and legs rufous; fcale of the petiole, with a fingle fpine; mandibles projecting, and parallel. Fabr.

Inhabits Gaudaloupe. The body is elongated; head large, grooved in the front; abdomen ovate and black; legs red.

Grossa. Blackifh; thorax bidentated under the fcutel; abdomen large and globular. Fabr.

Native of Cayenne.

This fpecies is large; the antennæ are pitchy, with the tip grey; head pitchy, fub-fpinous each fide; wings ferruginous.

Australis. Black; thorax unarmed; fcale of the petiole with two fpines. Fabr.

Native of New Holland. The body entirely covered with cinereous down.

Bidens. Thorax with two-toothed tubercle; head ovate; antennæ ferruginous; the firft joint black. Degeer.

Inhabits Surinam.

Biscutata. Thorax bidentated; fcale of the petiole double. Fabr.

Head pointed each fide behind; abdomen globular, with a black dorfal line; wings fub-ferruginous. Native of Cayenne.

Clavata. Black; thorax two-toothed; petiole one-toothed beneath. Fabr.

A large fpecies found in India; the thorax is gibbous; the petiole with a large tubercle, and fpine beneath; abdomen ovate, the firft fegment globular.

Arenaria. Thorax impreffed behind, and bidentated; body black; ends of the legs pitchy. Fabr.

Inhabits the moveable fands of Barbary. The head is large and ovate; thorax compreffed; the petiole with two tubercles; abdomen fomewhat globular and downy.

Attelaboides. Black; thorax two-fpined; head tapering behind; legs ferruginous. Fabr.

A Brafilian fpecies in the Bankfian cabinet; the head is rough and black; thorax flender, black; abdomen brown and downy.

Megacephala. Thorax two-fpined behind; ferruginous; abdomen black; head very large. Fabr.

Inhabits the ifle of France. The fpecies is fmall; head ovate, and larger than the whole body; antennæ and legs ferruginous; petiole with two tubercles.

Ammon. Thorax armed with two fpines; petiole of the abdomen with two incurvated fpines. Fabr.

Native of New Holland. The head is fmall and ovate; thorax and abdomen black, with gold down on the back; legs black.

Bihamata. Thorax four-fpined; petiole of the abdomen with two curved fpines. Drury.

The head is fmall and round; the antennæ long; abdomen fub-globular, black at the bafe, ferruginous; legs long and black; thighs ferruginous. Inhabits India.

Militaris. Thorax bi-fpinous before; fcale of the petiole armed with four fpines. Fabr.

An African fpecies. The head is large; gibbous, black, and carinated each fide between the antennæ; antennæ globular, black, and downy; wings brown.

4-Dens. Thorax quadridentated; body black; head with a double carinated ridge. Fabr.

Native of Cayenne. The fpines on the thorax placed two before, and two behind.

Sex-dens. Thorax armed with fix fpines; head very large, double, and armed with a fpine each fide behind. Linn.

Inhabits America.

Cephalotes. Thorax four-fpined; head large, double, and armed with a fpine each fide behind. Linn.

Native of South America, which it inhabits in prodigious number, and is extremely deftructive in the plantations.

Atrata. Thorax four-fpined; body black; head depreffed, margined and armed behind with two fpines. Linn.

Inhabits fame country as the former, and is like that fpecies exceedingly injurious.

Gulosa. Rufous; abdomen black at the tip, the firft fegment contracted; mandibles projecting. Fabr.

An Auftralafian fpecies.

Forficata. Brown; abdomen pubefcent, and black, the firft fegment contracted; mandibles projecting. Fabr.

Head large and flat; mandibles forked and toothed within; thorax compreffed in the middle; petiole with a globular tubercle; legs dull ferruginous. Inhabits New Holland.

Maxillosa. Thorax fix-toothed; head yellowifh, the mandibles as long as the head. Fabr.

Native of India; the head is large, and abdomen brown.

Rostrata. Thorax compreffed, three-toothed before; mandibles projecting and incurved. Fabr.

A fmall fpecies found in Cayenne.

Hamata. Ferruginous; head very large and pale; mandibles projecting and hooked. Fabr.

Head with a fmall conic fpine each fide at the bafe; mandibles longer than the head, black and hooked at the tip, the bafe ferruginous; petiole with two tubercles.

Hæmatoda. Scale of the petiole conic, and very acute; head nearly double, the mandible projecting. Linn.

The mandibles are toothlefs, and of a rufous colour; the head reddifh; thorax unarmed and black; wings hyaline. This fpecies inhabits America.

Pharonis.

Pharonis. Rufous; abdomen brownifh. Linn.

A very minute fpecies found in Egypt.

Salomonis. Red; abdomen black and fomewhat villous. Linn.

Native of Egypt and Arabia.

Foetida. Petiole with tranfverfely compreffed tubercles; firft fegment of the abdomen contracted; mandibles projecting. Linn.

The head is black with three raifed dots, the abdomen and legs hairy. This inhabits America.

Vaga. Black; abdomen ovate and hairy. Scop.

Native of Europe, and lives in decayed trees under the bark.

Venosa. Head and thorax black; abdomen cylindrical and brown; fcale of the petiole thick and entire; legs teftaceous; wings white with teftaceous veins, and a brown marginal fpot. Linn.

Country unknown.

Melanopis. Rufous; eyes black; abdomen brown on the back; fcale of the petiole entire. Linn.

This and the four following fpecies are natives of Europe.

Glabra. Black; glabrous; fcale of the petiole bidentated; incifures of the abdomen whitifh; legs rufous. Linn.

Testacea. Teftaceous-brown, and fomewhat downy; antennæ and legs brown; wings white with a ferruginous bafe. Linn.

Fuscescens. Black; head as wide as the abdomen; fcale of the petiole very fhort; mouth, antennæ, and legs reddifh-brown. Linn.

Ruficornis. Head and thorax black; abdomen brown; jaws, antennæ, and legs teftaceous; wings hyaline.

Formica-*leo*, the *ant-lion*, the name given by authors to a very remarkable fpecies of infect, which is, in its perfect ftate, a winged creature, approaching to the nature of the *libellulæ*, or dragon-flies; but in its prior ftate of a creeping animal, has a wonderful art and addrefs in catching its prey. It is in this ftate that it is known by the name of formicaleo, as it chiefly feeds upon ants. See Myrmeleon.

Formica, literally *an ant*, has been applied by the old medical writers to a fpecies of wart, of a black colour, and with a broad feffile bafe, which Foreftus obferves, when it is removed by excifion, undergoes much pain, refembling that arifing from the ftinging of ants, whence it has received its name. This fpecies of fenfation is alfo denominated *formication*, *formicatio*, and by the Greeks μυρμηκιασις, *myrmeciafis*, from μυρμηξ, *an ant*. The term *formicatio* is likewife applied to a fenfation occafionally occurring in the fkin, as if ants or other fmall infects were creeping upon its furface. See Forefti Opera, lib. xxiii. obf. 9.

Formica, among *Sportfmen*, the name of a difeafe incident to fpaniels. See Spaniel.

FORMICATIO. See Formica.

FORMICATION, a term ufed among *Builders* for arching or vaulting.

FORMICHI, in *Geography*, a clufter of fmall iflands and rocks in the Mediterranean, near the coaft of Italy, between Monte Chriftio and Pianofa. N. lat. 42° 40′. E. long. 10° 25′.

FORMICOLA, a town of Naples, in Lavora; fix miles E. of Capua.

FORMIGALES, a town of Spain, in the province of Aragon; 10 miles S.E. of Ainfa.

FORMIGI, a town of Italy, in the department of the Panaro; four miles S. of Modena.

FORMIGNANO, a town of the duchy of Urbino; feven miles from Foffombrone.

FORMIGUE, a fmall rocky ifland, near the French coaft, in the Mediterranean. N. lat. 43° 8′. E. long. 6° 18′.—Alfo, a fmall ifland in the Mediterranean, near the S. coaft of the Morea. N. lat. 36° 46′. E. long. 21° 49′.

FORMING is ufed for the act of giving being or birth to any thing.

The word is alfo fimply ufed for giving the figure to any thing. The potter forms his veffels as he pleafes. Geometry teaches how to form all kinds of figures.

It is alfo ufed for the producing of a thing: thus, the lineaments of the face began to be formed.

Forming *of a Siege*, in *Military Language*, is the making lines of circumvallation, to fortify the camp, and difpofing things for the attack of a place in form.

They alfo fay, to form a fquadron or battalion; meaning, to range the foldiers in form of a fquadron, &c.

The term is alfo ufed in fpeaking of a body of forces, which being out of any order of fquadrons, battalions, &c. do halt, range themfelves in order, and put themfelves in a condition for the attack.

Forming the line, is drawing up infantry, cavalry, and artillery into line of battle. See Line.

Forming *the flank*, *Angle*. See Angle.

Forming, in *Grammar*, is ufed in fpeaking of certain tenfes of verbs, which are made from others, by a change of certain letters.

The prefent tenfe is formed from the infinitive. Compound and derivative words alfo, and even all that have any etymology, are faid to be formed.

FORMOCHE, in *Geography*, a fmall ifland in the Grecian Archipelago; nine miles N. of Patmos.

FORMOSA, or Tai-ouan, an ifland in the Chinefe fea, feparated from the province of Fo-kien in China by a ftrait, about 60 miles in its narroweft part. This ifland, fituated between 22° 8′, and 25° 20′ N. lat., and 120° to 122° E. long., is about 240 miles in length from north to fouth, and about 60 miles in its greateft breadth from eaft to weft, but much contracted at each extremity. Formofa, though lying fo near to the coaft of China, was not known to the Chinefe until the year 1430. The Dutch formed an eftablifhment in the weftern part of it in 1634, and built the fort of Zealand, by which they fecured to themfelves the principal port of the ifland; but they were driven from thence in 1659, or 1661, by a Chinefe pirate, who made himfelf mafter of the whole weftern part, which afterwards, *viz.* in 1682, fubmitted to the authority of Kang-hi, emperor of China. This ifland is divided by a long chain of mountains, running from north to fouth, into two parts, the eaftern and weftern. The former part is little known, but the latter is divided into three diftinct governments, fubordinate to the governor of Tai-ouan, the capital of the ifland, who is himfelf fubject to the viceroy of the province of Fo-kien. This part, which is poffeffed by the Chinefe, prefents extenfive and fertile plains, watered by a great number of rivulets that fall from the eaftern mountains. Its air is pure and wholefome, and the foil produces, in abundance, corn, rice, and moft other grains. Moft of the Indian fruits are alfo found here; fuch as oranges, bananas, pine-apples, guavas, papaws, and cocoanuts; and fome of thofe of Europe, particularly peaches, apricots, figs, raifins, chefnuts, pomegranates, water melons, &c. Tobacco, fugar, pepper, camphor, and cinnamon are alfo common. Horfes, fheep, and goats are very rare in this ifland; of hogs, which abound in China, here are few; domeftic poultry, fuch as fowls, geefe, and ducks,

 are

are very plentiful: pheasants also are sometimes seen, and monkies and stags have multiplied so much, that they wander through the country in large flocks. The inhabitants of Formosa rear a great number of oxen, which they train for riding, from a deficiency of horses and mules, and which they accustom to go as expeditiously as the best horses, furnishing them with a bridle, saddle, and crupper. The only important article that seems to be wanting in Formosa is wholesome water, that which it supplies being of a deleterious quality. In this island there are few mulberry trees, and consequently little silk is produced: but if the Chinese were permitted to form establishments here, various profitable manufactures might be introduced. Those who come hither must be protected by passports from the Chinese mandarins, who grant them at a very dear rate, and accompany them with intolerable exactions and oppressions. The Chinese connive at this conduct on the part of the mandarins, because it serves to prevent numerous emigrations to this island, which is rendered a place of great importance by its proximity to China. Ever since Tartar conquerors have been on the throne, they are afraid lest any revolt should happen in Formosa, and disturb the security and tranquillity of the empire: and in order to prevent any disturbance, the Tartars keep a garrison here of 10,000 men, changing it every three years, or more frequently, if they find such a measure to be necessary.

The capital of this island, called Tai-ouan, is large and populous, and a place of great trade. It furnishes every necessary of life; not only the natural productions of the island, such as rice, sugar, tobacco, salt, stag's flesh dried, fruits of all kinds, medicinal herbs, cotton cloth, hemp, and various sorts of bark, but such foreign commodities as are imported hither, such as Chinese and Indian cloths, silk stuffs, varnish, porcelain, various kinds of European goods, &c. The streets are for the most part straight, and covered with awning during seven or eight months in the year, for the purpose of moderating the excessive heat of the sun. These streets are 30 or 40 feet broad, and some of them about a league in length; almost all of them are bordered with houses belonging to the merchants, or with shops, in which are displayed silk stuffs, porcelain, lacquer-ware, and other kinds of merchandize, arranged in great order, so as to appear like so many ornamented galleries. The houses are generally constructed of clay and bamboo-reeds, and are thatched with straw. This capital of the island has neither mills nor any kind of works; its harbour is good, and shelters vessels from every wind; but the entrance of it becomes every day more difficult, on account of the accumulation of sand. Besides this capital, the Chinese have two other cities, and some villages, in which they reside by themselves, as they do not permit the Indians, who are their subjects, to live among them; slaves and domestics excepted. These Indians are united into 45 villages, 36 lying towards the north, and nine towards the south. The northern villages are very populous, and the houses are built after the Chinese manner. The habitations of the southern islanders are only heaps of huts, or cottages of earth, in which they have no kind of furniture; but the middle part is occupied by a sort of hearth or chimney, elevated to the height of two feet, and constructed of earth, upon which they dress their victuals. Their ordinary food is rice, or other small grain, and the game they take by coursing, or kill with their arms. These islanders possess a wonderful degree of agility, and run with such swiftness, that they can almost outstrip the fleetest grey-hound. Their favourite arms are lances, which they dart to the distance of 60 or 80 feet, with the greatest dexterity and precision. They use bows and arrows, and can kill a pheasant on wing with as much certainty as an European sportsman could do with a fusee. As they have neither plates, dishes, nor spoons, they use their fingers in feeding themselves, and eat their flesh half raw. Their beds are formed of fresh-gathered leaves. Their bodies are naked, excepting a piece of cloth, which hangs from their girdle to their knees. Those among them who, according to the judgment of their chiefs, have excelled by agility in running, or by dexterity in the chace, obtain the privilege of marking on their skin, by a very painful operation, several fantastical figures of flowers, trees, and animals; all have the right of blackening their teeth, and of wearing ornaments of bracelets, and crowns made of shells and crystal. The islanders of the northern parts, where the climate is colder, clothe themselves with the skins of stags, which they kill in hunting; on their heads they wear a cap in the form of a cylinder, made of palm-leaves, and ornamented with several crowns placed one above another, on the top of which they fix plumes composed of the feathers of a cock or a pheasant. The marriage ceremonies of the Formosans approach very nearly to the simple laws of nature; parents are scarcely ever consulted, but young persons settle their matrimonial union according to their own discretion.

Although these islanders are entirely subjected to the Chinese, they still preserve some small remains of their ancient government. Each village chooses two or three old men of the greatest reputation for probity; and in consequence of this choice, they become the rulers or judges of the hamlet, and have the power of finally determining all differences: and if any one should refuse to abide by their judgment, he would be immediately banished from the village, nor could any of the inhabitants afterwards dare to receive him.

The tribute imposed by the Chinese is paid in grain, and the mode of laying and collecting this impost is settled by a person specially appointed for this purpose. But these persons are very arbitrary and oppressive; insomuch that they have by their tyranny caused the desertion of three villages in the southern part of the island, where were formerly twelve. They expelled the tax-gatherers, refused to pay tribute to the Chinese, and joined themselves to the independent nation in the eastern part of the island.

In 1782 a dreadful disaster befel Formosa, occasioned by a violent hurricane, which caused such a swell of the sea, that it overwhelmed a great part of the island, and destroyed many buildings on the land, with stores of various kinds contained in them, several ships and their cargoes in the harbour, a quantity of provisions and growing crops. This grievous calamity, however, was redressed by the paternal attention and care of the Chinese emperor.

Between Formosa and the continent are several small islands called "Pong-hou" by the Chinese, and "Piscadores" by the Europeans, which form a kind of Archipelago; of these islands, the principal only is inhabited by a Chinese garrison under the command of a mandarin. Duhalde. Grosiere.

Formosa, an island of the Atlantic, near the coast of Africa, about six miles long and one wide. The soil is fertile, and well covered with trees, but wants springs of good water. N. lat. 11° 29′. W. long. 14° 20′.

Formosa, *Benin*, or *Argon*, a river of Africa, which rises in the interior part of Benin, and runs into the Atlantic. N. lat. 5° 40′. W. long. 4° 20′. For several leagues along the river upwards the land is low and marshy, but the banks are adorned with lofty trees, and divided by branches of the river into a number of islands, which afford a pleasant prospect: however, the air is insalubrious, and the musquitoes innumerable.—Also, a river of Africa, which

runs

runs into the Indian fea, S. lat. 34° 18'.—Alfo, a river of Brazil, which runs into the Atlantic, S. lat. 22° 25'.

FORMOSA *Bay*, a bay of the Indian fea, on the coaft of Africa. S. lat 2° 45'.

FORMOSA, *Cape*, a cape on the coaft of Guinea, fo called from its beautiful appearance; it is low, flat, and woody. N. lat. 5° 45'. E. long. 4° 52'.—Alfo, a cape on the coaft of Malacca; 30 miles S.E. of Malacca.

FORMOSUS, POPE, in *Biography*, fucceeded to the high dignity on the death of Stephen VI. He had pofſeffed, previoufly to his election to the papal chair, high church honours, and had been bifhop of Porto, and fent legate from the Roman fee into Bulgaria, to folve fome doubts relating to religious matters which were entertained by the people of that country, who had lately become converts to the Chriftian faith. Under the pontificate of John VIII. he was accufed of confpiring againft the lives of the emperor and pope, and not appearing to anfwer the heavy charge, he was excommuncicated and anathematized. To make his peace he was obliged to fwear that he would never return to Rome, nor refume the epifcopal dignity, but content himfelf, during the remainder of his life, with lay communion. In 883 he was abfolved from his oaths by pope Marinus, who declared him innocent of the crimes alleged, and reftored him to his epifcopal functions: and in 891 he was elected pope in the room of Stephen. Formofus was the firft pope who was tranflated from another fee to that of Rome; for, till his time the bifhops of Rome had all been raifed to that office from among the prefbyters and deacons of the church. Formofus was fcarcely fettled in his chair when legates arrived at Rome from Conftantinople to fettle the difpute refpecting the perfons who had been ordained by the patriarch Photius, who had been anathematized by the preceding popes. Being unable to accomplifh the object of their miffion, they returned, and the conference which was intended to heal fubfifting divifions, widened ftill farther the breach between the eaftern and weftern churches. Formofus, in the following year, fent legates to prefide at the council of Vienna, to redrefs abufes that prevailed in the kingdom of Arles: he efpoufed the caufe of Charles the "Simple" of France againft Odo, who, upon the death of that prince's father, had feized on the kingdom of Aquitaine, and had even been crowned king of France. His letters, however, to Odo were unavailing, and it was not till his death that the family of Charlemagne regained poffeffion of the whole of France. In the year 894 Formofus crowned Lambert emperor in the room of his deceafed father Wido: but Berengarius laid claim to the kingdom of Italy, which caufed a bloody war between the contending parties. The pope invited Arnulph, king of Germany, to Rome, promifing to crown him emperor, provided he reftored peace to the country by vanquifhing the prefent emperor and his rival. Arnulph complied, entered Italy with a powerful army, made himfelf mafter of Lombardy, marched to Rome, obtained poffeffion of the city, and was crowned emperor by the pope. After this, to fettle matters more completely, the kingdom of Lombardy was divided between Lambert and Berengarius, and Arnulph returned to Germany. Formofus died in the year 896, after a reign of about four years and a half. In the "Collectio Conciliorum" there are two letters extant which bear the name of Formofus, one refpecting the affairs of the Eaft, and the other addreffed to the bifhops of England; the latter is not generally regarded as genuine. The fucceffor of Formofus, Stephen VII., was his bitter enemy, and determined to difgrace him after his death, whom he durft not openly oppofe while alive. He accordingly, as one of his firft acts, fummoned a council to meet at Rome, and placed the body of the dead pontiff, taken from his tomb, on the pontifical throne; and having affigned him a deacon to plead his caufe, he uttered a furious philippic againft him, and pronounced him guilty of the charge of illegally intruding himfelf into the apoftolic fee. He was next ftripped of his ornaments; three of the fingers, with which it was cuftomary to beftow the papal benediction, were cut off, and the body, with a large ftone fufpended about its neck, was thrown into the Tyber, and all ordinations which Formofus had conferred were declared invalid. In the next pontificate, under Theodore II. the body of Formofus was reftored with great pomp to its fepulchre in the Vatican; and by John IX. the acts of Stephen's council were condemned to the flames. See JOHN, STEPHEN, and THEODORE.

FORMULA, a rule, or model, or certain terms prefcribed and decreed by authority, for the form and manner of an act, inftrument, proceeding, or the like. The Roman law was full of formulas. The formulas of Marculphus, with M. Bignon's Comment, are in great efteem.

FORMULA, in *Church Hiftory* and *Theology*, denotes a formulary or profeffion of faith.

FORMULA, in *Mathematics*, a general expreffion for refolving certain cafes or problems. E. G. $\sqrt{dx - x^2}$ is the formula that expreffes the ordinate of a circle, having d for its diameter and x for its abfciffa.

FORMULA, in *Medicine*, denotes a little form or prefcription, fuch as phyficians direct in extemporaneous practice, in diftinction from the greater forms, which are the official medicines. See PRESCRIPTION.

FORMULARY, a writing, containing the form or formula of an oath, declaration, atteftation, or abjuration, &c. to be made on certain occafions. There are alfo formularies of devotion, of prayers, &c. Liturgies are formularies of the public fervice in moft churches.

FORNA, in *Ichthyology*, a name given by Hildegard, and others, to the trout.

FORNACALIA, or FORNICALIA, in *Antiquity*, a feaft held among the ancient Romans, in honour of the goddefs Fornax, or Fornix. It was folemnized with facrifices, performed before the mouth of an oven, wherein they dried their corn, baked their bread, &c. The fornacalia were moveable: the grand curio proclaimed the time of celebration every year on the twelfth of the calends of March. They were firft inftituted by Numa; and the quirinalia were inftituted for the fake of fuch as had not kept the fornacalia.

FORNAGE, FORNAGIUM, in our *Old Writers*, fignifies the fee taken by a lord from his tenants, bound to bake in the lord's oven, or for a permiffion to ufe their own; this was ufual in the northern parts of England. Plac. Parl. 18 Ed. I. See ASSISA *panis et cerevifiæ*. (51 Hen. III.) The word comes from the French *fournage*, which fignifies the fame.

FORNAZZANO, in *Geography*, a town of Italy, in the departmen of the Amona; 15 miles S.S.W of Faenza.

FORNELLA, a port and bay in the ifland of Minorca. The port is fituated about fix miles from mount Toro, and defcribes a circle, the entrance of which is very narrow and facing the north. The bay is capable of containing the largeft fleet, and perfectly fheltered. The port is defended at the entrance by a fmall fquare fort, conftructed of hewn ftone, with baftions and foffes. This rampart is covered with magazines and lodgments, which are vaulted; on the oppofite fide is a tower, and at the further end of the port, upon a rock or ifle, is a fort, built of wood. The eftablifhment is capable of fupporting a conftant garrifon

rison of 300 men. Near this is a small village of the same name, inhabited only by fishermen.

FORNELLO, a town of Naples, in the Molise; 17 miles W. of Molise.—Also a river which runs through the city of Naples into the sea.

FORNICATION, Whoredom, the act or crime of incontinency between single persons; for, if either of the parties be married, it becomes adultery. The term is derived from the *fornices* in Rome, where lewd women prostituted themselves for money.

By the ancient law of England, the first offence herein was punished with three months imprisonment: the second was made felony by an act passed A.D. 1650, in the time of the usurpation. The spiritual court hath cognizance of this offence; and doing public penance is the chief punishment. But by stat 27 Geo. III. c. 44 the suit must be instituted within eight months, and not at all after the intermarriage of the offending parties. Formerly courts-leet had power to inquire of and punish fornication and adultery: in which courts the king had a fine assessed on the offenders, as appears by the book of Domesday. 2 Inst. 488. See Bastard.

Fornication is sometimes used as a generical term, including all kinds of offences against chastity.

Its species are, 1. *Simple fornication*, which is that committed with a prostitute. 2. *Stuprum*, that committed with persons of reputation and sobriety. 3. That committed with relations, called *incest*. 4. That committed with married persons, *adultery*. 5. That committed with persons consecrated to God, *sacrilege*. 6. That committed between persons of the same sex, *sodomy*. 7. That committed by persons on themselves, *manustupration*. And, 8. That committed with beasts, *bestiality*.

FORNIX, in *Anatomy*, a medullary body contained in the lateral ventricles of the brain. See Brain.

FORNULUS, in *Geography*, a town of Italy, in Venetia, N. E. of Aquileia.

FOROMAN, a town of the island of Sumatra, near the west coast; 150 miles S. of Acheen.

FORONOVO, a town of Italy, in the duchy of Parma; 8 miles W. S. W. of Parma.

FORPRISE, in *Law*, an exception, or reservation; in which sense the word is used in the statute of Exon. 14 Edw. I.

We still use it in conveyances and leases, wherein excepted and forprised are synonymous terms.

Forprise is also used for an exaction; in which sense it amounts to the same with forecapium.

"Totum pratum, &c. sine quaeunque forprisa in excambium pro placca dedit."

FORQUERAG, Anthony, and John Baptist Anthony, in *Biography*, father and son, both French musicians, who were patronized by Louis XIV. during their infancy. Anthony, the eldest, was born at Paris in 1671; his father, a professor on the violin, gave him lessons in early infancy, of which he profited so much, that at five years old he played many times to the king, who used to call him his "petit prodige." At 20, the young Forquerag was the best performer on the violin of his time; he had also a genius for composition, and produced pieces equally harmonious and melodious. His talents, and still more the sweetness of his temper, introduced him into the best company, which he regaled with his performance whenever desired. The regent duke of Orleans chose him for his master in music, and constantly honoured him with his patronage. This musician died at Mantes in 1745, and left a son born in 1700. This was John Baptist Anthony, of the king's chamber and chapel band, who equalled his father in talents. He, as well as his father, performed before Louis XIV. at the age of five or six, and astonished the whole court by the prodigious execution which he had acquired at so tender an age. The prince of Conti had a great affection for this musician, and engaged him in his service. On the death of that prince, Forquerag quitted the profession, and finished his days in tranquillity in the bosom of his family, by whom he was much beloved and respected. Madam Forquerag, his wife, excelled on the harpsichord, and till 1780 played with so much grace and facility, that she may be regarded at the head of female dilettanti. Laborde.

FORRAGE, or Forage, provision for cattle, of hay, oats, and straw; particularly in war.

Skinner derives the word from *foras agere*, by reason they go abroad to seek forrage; others from *far*, which anciently signified any kind of corn or grain. Menage, from *foderagium*, of *foderum*, or *fodrum*, which the Romans used in the same sense. Cujas and Du-Cange derive it from the German *futter*, horse meat; Vossius, from the German *foden*, or *voeden*, to feed; Nicod, from *farrago*, which literally signifies what we call forrage, and figuratively, a mixture of divers kinds of things; Hicks derives it from the Saxon *fodra*, or the English *fodder*, or the base Latin *fodrum*. See Fodder.

This term relates to the acquisition and distribution of such supplies as are immediately necessary for the subsistance of troops, or for the formation or maintenance of any post or station; being for the most part an arbitrary demand, such as we understand by the affectedly delicate term "requisition" used by the French, but which is in effect only a contributory species of pillage: it is to be supposed that foraging takes place chiefly in an enemy's country. Such is, indeed, the case; whence it is found expedient to strengthen the covering parties sent out with foragers, so far as may be safely done without weakening the main body, or creating too much fatigue.

The cavalry form a very prominent feature on all forages; each trooper being furnished with a sack, such as may lie conveniently over the saddle-bows, and another over the loins of his steed, on the cloak-pad, or eventually to stand upright on it, and to fasten by means of a strap passing round his own waist. Whatever means may be employed it is highly necessary that no fastenings should be used, except such as may be undone in an instant: nor ought any horse to be laden so as to prevent his keeping up a moderate trot on emergency. Further attention should be paid to keeping every trooper's arms clean for action.

When troops are detached on this important duty, the whole of the country must be well searched, lest the enemy, having intelligence of the intention, should take means, by ambuscade or otherwise, for cutting off the foragers. For this purpose small parties of cavalry, each having a trumpeter, should proceed beyond the places to be foraged, and post lines of *videttes*, or centries, so as to obtain a full command of the whole country; they being situate on such eminences, steeples, &c. as might best favour the precaution. In the mean while the several foragers collect the several articles they may find, or stand in need of; taking care to pack them into the smallest compass, and securing every bundle with proper bands, &c.

So soon as an alarm is given, the troops must concentrate, in such manner as may have been previously directed, but without losing sight of the object of their mission. Here arises a very delicate and critical case; for, on the judgment of the superior officers all will depend. If a large force

force ſhould appear, ſuch as could not ſafely be oppoſed, the forage muſt be abandoned; unleſs, indeed, reinforcements may be obtainable within a reaſonable time; ſuch being the caſe, the moſt obſtinate defence muſt be made; eſpecially if the army be in diſtreſs for proviſions, &c.

The enemy, though unable perhaps to make any efficient attack, will endeavour to excite alarm among foragers, ſo as either to cauſe their remaining within narrow limits, or to retire with a ſcanty ſupply. Such ſhould always be diſtinguiſhed, and though vigilantly watched, left a larger body ſhould be at hand, ought never to prevent the completion of the duty. When the whole are ready for retreat, the carts, waggons, &c. if any are employed, are firſt ſent on towards the camp, together with the infantry as an eſcort; the laden cavalry then cloſe in, and, in their turn, are protected by the eſcorts of horſe.

Where great reſiſtance is expected, it is ſometimes neceſſary for a few guns, eſpecially horſe-artillery, to proceed with the foragers; but the utmoſt endeavours ſhould be uſed to avoid coming to action. In ſome inſtances the whole army move to the ſcene of plunder, for the purpoſe of carrying off whatever may be procurable, and for which conveyance can be provided; the camp being left under charge of a few ſmall detachments, or piquets; but ſuch can happen only on great emergency, or when the enemy are ſo near as to render it inexpedient to detach any portion.

A ration of forage, for the daily conſumption of one horſe, conſiſts of 10lb. of oats, 20lb. of hay, and 5lb. of ſtraw. When hay may not be obtainable more oats are allowed, or *vice verſâ*. When on foreign ſervice ſubſtitutes are of courſe adopted, and diſtributed *ad valorem*.

Forrage-*guard*, in *Military Affairs*, a detachment ſent out to ſecure the foragers. The forrage-guard is poſted at all places, where the enemy's parties may come to diſturb the foragers. This guard is likewiſe called the *covering party*, and marches generally that night before the foraging, that they may be poſted in the morning before the foragers come. The guard conſiſts both of horſe and foot, and muſt ſtay at their poſt till the foragers be all come off the ground. See the preceding article.

FORRENBACH, in *Geography*, a town of Germany, in the territory of Nuremberg; five miles E. S. E. of Herſbach.

FORRES, a town ſituated near the mouth of the river Findhorn, on a riſing ground three miles diſtant from the bay of the ſame name, is a royal burgh, in the county of Moray; and though it is uncertain when it received this privileged diſtinction, yet it is noticed in records as a conſiderable place in the thirteenth century. The corporation conſiſts of a provoſt, two bailiffs, and a dean of guild, elected annually; and the town, conjointly with Fortroſe, Nairn, and Inverneſs, ſends one member to the Britiſh parliament: it is the ſeat of a preſbytery. The houſes, which are in general neatly built, amounted, according to the returns made to government in 1801, to 663, containing 3114 inhabitants; of whom 380 were employed in trade and manufactures. The river is navigable up to the village of Killos, within two miles of the town, where is the port belonging to this place. The Findhorn abounds with ſalmon and other fiſh, and the fiſheries on it are very productive. To the ſouth of the town, on an eminence, ſtands the houſe of Burdsyards, commanding a fine proſpect, and ſurrounded by extenſive plantations; on an eminence at the weſt end of the town ſtood a caſtle, built by ſome of the early kings, and burnt at the reformation. Near Forres, in the pariſh of Rafford, is a very ſingular remain of antiquity; it is an upright pillar, known under the denomination of "Sweno's ſtone." This, which exceeds all other obeliſks to be ſeen in Scotland, is perhaps the fineſt monument of the Gothic kind to be found in Europe. It is thus deſcribed by Mr. Pennant in his Tour in Scotland. "It is three feet ten inches broad, and one foot three inches thick; the height above ground is 23 feet; below, as it is ſaid, 12 or 15. On one ſide are numbers of rude figures of animals and armed men, with colours flying; ſome of them ſeem bound like captives. On the oppoſite ſide was a croſs included in a circle, and raiſed above the ſurface of the ſtone. At the foot of the croſs are two gigantic figures, and on one of the ſides is ſome elegant fret-work." The column appearing likely to fall, a few years ſince was ſet upright, and guarded by the addition of ſeveral free-ſtone ſteps erected round the baſe. Various have been the conjectures reſpecting the age and purport of this monument. That of the late reverend Mr. Cordiner appears the moſt probable. In his remarks, which accompanied a drawing of the pillar ſent to Mr. Pennant, he ſuppoſes it to have been ſet up in commemoration of the peace concluded between Malcolm, king of Scotland, and Canute, the Daniſh king of England, in the year 1002; when the Danes, who had long been in poſſeſſion of Moray, finally relinquiſhed that province by ſtipulation.

In a moor not far from Forres, Shakſpeare places Macbeth's rencounter with the witches. Below the ſtone, at the head of an inlet of the ſea, are ſome remains of Kinloſs abbey, founded in 1150 by David I. for Ciſtercian monks, and amply endowed. The ruins were ſold, in 1651, to build the citadel of Inverneſs. On the oppoſite ſide of that inlet was Conebin eſtate, overwhelmed with ſand about a century ago. The country, for ſeveral miles weſt of Forres, is level, well cultivated, and adorned with fine plantations, ſeats, old caſtles, &c. In a hollow of that tract there was diſcovered, in the laſt century, a ſhip's anchor four feet below ground, whence, and from other circumſtances, it would appear that the whole of the low-lands along the coaſt of the Frith was anciently covered with the ſea. To the ſouth of Forres lies the foreſt and caſtle of Tarnaway, formerly the reſidence of the earls of Moray. This caſtle is noted for its ſpacious hall, named from earl Randolph, one of the ſupporters of Robert Bruce. In the church-yard of Dyke, weſt of Forres, is part of a ſtone-croſs ornamented with rude reliefs. N. lat. 57° 36′. W. long. 3° 42′.

FORRESTER'S Island, a ſmall iſland in the North Pacific ocean, about 14 miles N. W. from the S. W. coaſt of the Prince of Wales's Archipelago, ſo called by Mr. Dixon. N. lat. 54° 50′. E. long. 126° 38′.

FORS, a town of Sweden, in Weſt Gothland; 17 miles S. S. E. of Uddevalla. — Alſo, a town of Sweden, in Jamtland; 44 miles N. of Sundſwall.

FORSE, a river of Scotland, in Caithneſs; which runs into the North ſea; ſix miles W. of Thurſo.

FORSES, Catadupæ, a term uſed in Weſtmoreland for water-falls.

FORSKALEA, in *Botany*, named by Linnæus in memory of his pupil Peter Forſkal, a Swede, who being ſent, at the expence of the king of Denmark, to inveſtigate the natural productions of the Eaſt, in company with the celebrated Niebuhr, died at Jerim in Arabia, July 11, 1763, aged 31. His notes and deſcriptions, rich in information reſpecting the natural hiſtory of Egypt and Arabia, but not corrected by references to other authors, as they would have been by himſelf for the preſs, were publiſhed in three quarto volumes, under the direction of his fellow-traveller, at Copenhagen in 1775. Linn. Mant. 11. Schreb. Gen. 268. Willd. Sp. Pl. v. 2. 474. Mart. Mill. Dict.

v. 2. Ait. Hort. Kew. v. 2. 121. Juſſ. 403. Gærtn. t. 68. (Caidbeja; Forſk. Fl. Ægyptiaco-Arab. 82.) Claſs and order, *Octandria Tetragynia*. Nat. Ord. *Scabridæ*, Linn. *Urticæ*, Juſſ.

Gen. Ch. *Cal.* Perianth erect, of four oblong, parallel, permanent leaves. *Cor.* Petals eight, rude, ſpatulate, concave, erect, withering, ſhorter than the calyx, the claw and border of equal length. *Stam.* Filaments eight, thread-ſhaped, one within each petal, elaſtic, the length of the calyx; anthers of two roundiſh lobes. *Piſt.* Germens four, diſtant, oblong, woolly; ſtyles briſtle-ſhaped; ſtigmas ſimple. *Peric.* none. *Seeds* four, oblong, compreſſed, tapering at each end, enveloped in wool.

Eſſ. Ch. Calyx of four leaves, longer than the corolla. Petals eight, ſpatulate. Pericarp none. Seeds four, entangled in wool.

Obſ. Linnæus remarked that "the number in the parts of fructification varies, and that the flower is extremely difficult to diſſect and underſtand;" owing to the wool with which all its organs are entangled. He places this genus in *Decandria Pentagynia*. Murray, Schreber, and Willdenow have conſidered it as belonging to *Octandria Tetragynia*. Juſſieu, not without heſitation, but apparently for good reaſons, differs widely from Linnæus and his followers in his view of this flower, conſidering it as monoecious, and underſtanding the petals of Linnæus as monandrous male florets, each of one ſcale, varying in number from ſeven to ten, and ſurrounding the female florets, which are central, and vary likewiſe in number from three to five, the wool being to them in the place of the ſcales of the others. To this it may be objected, that the number of the female organs always keeps pace in *Forſkalea* with the male ones, as in true ſimple flowers, whereas in monoecious, or compound ones, a luxuriance in the one kind is generally, perhaps invariably, compenſated by a deficiency in the other. The analogy of *Parietaria* moreover, a genus cloſely allied to *Forſkalea*, is not favourable to the theory of Juſſieu. We however readily follow this author and Niebuhr in preference to Linnæus and others, in the orthography of the name, and conſequently *Salvia Forſkalii* is the true ſpelling, not *Forſkælii*. Three ſpecies of this genus are known.

1. F. *tenaciſſima*. Linn. Mant. 72. Suppl. 245. Linn. fil. Ic. t. 1. Jacq. Hort. Vindob. v. 1. t. 48. (Caidbeja adhærens; Forſk. Fl. 82. Chamædryfolia tomentoſa Maſcatenſis; Pluk. Almageſt. 97. Phyt. t. 275. f. 6. Luſſaq of the Arabs.)—"Plant clothed with briſtly hairs. Leaves elliptical, pointleſs. Calyx-leaves oblong-lanceolate, acute." Ait. H. Kew.—Native of vallies between the calcareous hills of the deſert to the eaſt of Cairo. This plant has much of the aſpect of the common Pellitory, *Parietaria officinalis*, except a more hoary whiteneſs on the backs of the leaves and about the calyx. It is annual, flowering in the latter part of ſummer, and requires to be kept with us in the green-houſe, where few perſons, except for curioſity, would deſire to have it. The briſtles of the *ſtem* and *leaves* are finely hooked, by which they ſtick to any thing that comes in their way. The *calyx* is enlarged after flowering, and falls off with the ſeed.

2. F. *candida*. Linn. Suppl. 245. Thunb. Prod. Cap. 77. (F. ſcabra; Retz. Obſ. faſc. 3. 31.)—Plant rough with cartilaginous points. Leaves elliptical, wavy, pointleſs. Calyx-leaves obovate, obtuſe—Native of the Cape of Good Hope, from whence, as we learn by the Hortus Kewenſis, it was ſent by Mr. Maſſon to Kew in 1774, where it is kept in the green-houſe, and flowers in June and July. The *ſtem* is perennial and ſomewhat ſhrubby, much branched, rough, like the upper ſide of the *leaves*, with harſh horny points, often hooked. The blunt *calyx-leaves* moreover diſtinguiſh this ſpecies from the preceding.

3. F. *anguſtifolia*. Retz. Obſ. faſc. 3. 31. Murray in Comm. Gott. for 1784. 24. t. 2.—Plant briſtly. Leaves lanceolate, green on both ſides; their teeth briſtly. Calyx-leaves lanceolate, briſtle-pointed. Found by Maſſon in the iſland of Teneriffe. Hort. Kew.—It is annual, kept in the green-houſe, and flowers in July and Auguſt. This is like the other two, but rather more briſtly and with narrower *leaves*, which are ſcarcely hoary at the back, except when young. Their teeth are tipped with ſtraight ſpinous briſtles; their upper ſurface rough with hooked ones. The leaves of the *calyx* are remarkably narrow, and very briſtly. The *petals* are reddiſh.

Linnæus is ſuppoſed in the name of the firſt ſpecies, *tenaciſſima*, to have complimented rather than ſatirized the character of Forſkal, who was an indefatigable and acute obſerver, and did not eaſily forget what he had once acquired. In that of the ſecond, *candida*, one of the laſt names Linnæus ever applied, he unqueſtionably deſigned to do honour to the temper of his friend, whoſe works had juſt been preſented to him, from the king of Denmark, in a ſplendid form, and are now in the hands of the writer of this paragraph.

FORSOOTH, in *Antiquity*, a title of honour, anciently given to ladies, and ſtill retained, as well as dame, in ſome of the exiſting religious communities of Engliſh women, which were eſtabliſhed on the continent above two centuries ago, as forſooth Mary, forſooth Ann, no leſs than dame Mary, dame Ann, &c.

FORST, in *Geography*, a town of Germany, in the principality of Culmbach; 4 miles N. N. E. of Neuſtadt.

FORSTA, a town of Luſatia, on the river Neiſſe; the inhabitants of which are employed in manufacturing fine woollen and linen cloths and carpets, and brewing beer: 54 miles N. N. E. of Dreſden. N. lat. 51° 43′. E. long. 14° 40′.

FORSTENOVE, a town of Germany, in the biſhopric of Oſnabruck; 15 miles from Oſnabruck.

FORSTER, John, in *Biography*, a learned German divine, was born at Augſburg in the year 1495. He received the early parts of his education in his native city; and then went to Ingoldſtadt in Bavaria, where he enjoyed the opportunity of profiting by the inſtructions of the celebrated Reuchlin, who, though at that time in his ſeventieth year, took great delight in aſſiſting and encouraging the literary purſuits of young perſons. Under this tutor Mr. Forſter made great progreſs in his ſtudies, and excelled particularly in the Hebrew and Greek languages. From Ingoldſtadt he went to Leipſic, where he ſtudied theology, and thoſe other branches of literature which were connected with the clerical profeſſion. Here he firſt commenced teacher of the Hebrew language and divinity: he afterwards removed to the univerſity of Wittemberg, where he was admitted to the honour of doctor of divinity. At this univerſity he diſcharged, with high reputation, the duties of public profeſſor of Hebrew, and at the ſame time rendered eſſential ſervice to the Proteſtant religion by his labours as a preacher. When Luther undertook his tranſlation of the bible, he frequently availed himſelf of the aid of Forſter, and ſubmitted to his judgment reſpecting the ſenſe of difficult paſſages more readily than to that of any other man. He died at Wittemberg in 1556, when he was about ſixty-one years old, highly beloved for his candour and amiable diſpoſition, and reſpected for his great literary attainments. He was author of a valuable Hebrew dictionary,

dictionary, which was printed at Bafil in 1557. There were two other perfons by the fame name: the one a Lutheran divine, profeffor at Wittemberg, and minifter at Eifleben, where he died in 1613. He was author of commentaries on Exodus, Ifaiah, and Jeremiah, in three vols. 4to. a treatife "De interpretatione Scripturarum," 4to. and other critical and theological productions. The other, John Forfter, entitled to notice, was a jurift at Padua, and author of a work entitled "Proceffus judiciarius Cameralis." Moreri. Gen. Biog.

Forster, Nathaniel, a learned divine of the church of England, was born at Stadfcombe, Devonfhire, in the year 1717. Soon after his birth his father, who was a clergyman, removed to Plymouth, where he educated his fon in the elements of learning, and then fent him to the grammar-fchool of that town, of which he was the head fcholar before he was thirteen years of age. In 1731 he was removed to Eton, and at the fame time entered at Pembroke college, Oxford, in order to entitle him to the benefit of an exhibition of forty pounds per annum. In 1733 he was admitted fcholar of Corpus Chrifti college, and after taking his degrees, he was elected fellow in the year 1739: in the fame year he received deacon's orders, and in 1741-2 was ordained a prieft. His time was chiefly fpent at college in a clofe application to his ftudies, by which he acquired a high reputation, and a vaft knowledge of the dead languages. His firft preferment in the church was the rectory of Heathe, in Oxfordfhire, which was prefented to him in 1749 by the lord-chancellor Hardwicke, on the recommendation of Dr. Secker, bifhop of Oxford, his earlieft friend, who alfo introduced him to the notice of Dr. Butler, at that time bifhop of Briftol, who appointed him his domeftic chaplain, when he was tranflated to the fee of Durham in 1750. Mr. Forfter now quitted the univerfity, and was admitted to the degree of doctor of divinity. He continued chaplain to the bifhop of Durham till the death of that prelate, who, though he had not given him any preferment in the church, muft have highly efteemed him, as he appointed him executor to his will, with a legacy of 200*l*. Dr. Forfter now returned to college, with a determination to devote his time to literary purfuits; but in 1752 he was made one of archbifhop Herring's chaplains, who in a fhort time promoted him to a prebendal ftall in the church of Briftol, and prefented him alfo with the valuable vicarage of Rochdale in Lancafhire. He was elected a fellow of the Royal Society in 1755: made one of his majefty's chaplains, and appointed preacher at the Rolls chapel. In 1757 he married a lady of confiderable fortune, and fettled in Craig's court, Weftminfter; but before the end of the fame year he died. Among his connections and friends he could rank almoft all the eminent men of his time, and he left behind him a high character for all the private virtues that adorn life. He was author of many works, of which the principal are "Reflections on the natural antiquity of Government, Arts, and Sciences in Egypt," 1743. "Platonis Dialogi quinque: recenfuit, notis illuftravit, Nathaniel Forfter, A M." &c. 1745. "Appendix Liviana, continens I. felectus Codicum. MSS. et editionum antiquarum lectiones, præcipuas variorum emendationes, et fupplementa lacunarum in iis T. Livii que fuperfunt libris. II. J. Frienfhemii fupplementorum libros X. in locum decadis fecundæ Livianæ deperditæ," 1746. "Biblia Hebraica, fine punctis, accurante Nath. Forfter, &c. 1750." Gen. Biog.

Forster, John Reinhold, an eminent naturalift and philologift, was the fon of a burgomafter at Dirfchaw, in Polifh Pruffia, where he was born October the 22d, in the year 1729. In early youth he had few advantages for education; but about the age of fifteen years, he was admitted into the gymnafium of Joachimfthal at Berlin. Under the tuition of Menzelius and Heinfius, he made confiderable progrefs in the learned languages: and he alfo devoted a part of his attention to the ftudy of the Coptic, and to the acquifition of feveral of the modern languages, and particularly the Polifh. In the year 1748, he was entered at the univerfity of Halle, where he ftudied theology, and continued his application to the learned languages, among which he comprehended the oriental. After three years he removed to Dantzic, and diftinguifhed himfelf as a preacher, imitating the French rather than the Dutch manner; and in 1753, he obtained a fettlement at Naffenhuben. In the following year he married his coufin, Elizabeth Nikolai. During his refidence in this place, he employed his leifure hours in the ftudy of philofophy, geography, and the mathematics, without defifting from farther improvement in his acquaintance with the ancient and modern languages. With a fmall income and increafing family, the difficulties he experienced induced him to accept the propofal of removing to Ruffia, in order to fuperintend the new colonies at Saratow. Much, however, as he was approved during an interview with the members of government at Peterfburgh, fome circumftances occurred which rendered his new appointment of fhort duration; but on his return to the capital, advantageous offers were made to him both by the academy of fciences, and by that of Mofcow, both which he thought proper to decline. Having for fome time indulged unavailing expectations from the Ruffian government, he removed to London in the year 1766, with ftrong recommendations, but with very little money. After his arrival, he received from the government of Ruffia a prefent of 100 guineas; and he alfo made an addition to his ftock by the tranflation of Kalm's Travels and Ofbeck's Voyage. At this time lord Baltimore propofed to him a fettlement in America, as fuperintendant of his extenfive property in that country; but he preferred the place of teacher of the French, German, and natural hiftory in the diffenting academy at Warrington. This fituation, however, he foon abandoned; and returning to London, he was engaged, in the year 1772, to accompany captain Cook, as a naturalift, in his fecond voyage round the world. At this time he was 43 years of age, and his fon George, who went with him, was 17. Upon his return to England in 1775, the univerfity of Oxford conferred upon him the degree of doctor of laws. At this time he was projecting, with the affiftance of his fon, a botanical work in Latin, containing the characters of many new genera of plants, which they had difcovered in the courfe of their voyage. An account of the voyage having been publifhed by his fon in Englifh and German, the father was fuppofed to have had a confiderable fhare in it; and as he had entered into an engagement not to publifh any thing feparately from the authorized narrative, he thus incurred the difpleafure of government, and gave offence to his friends. Independently of the violation of his engagement, he was alfo chargeable with having introduced into his work feveral reflections on the government which appointed, and alfo on the navigators who conducted the expedition. The father and fon, finding that, in confequence of thefe circumftances, their fituation in London was become unpleafant, determined to quit England. Before the execution of their purpofe, their condition became embarraffed and diftreffing; but happily for Mr. Forfter, he was invited, in 1780, to be profeffor of natural hiftory at Halle; he was alfo appointed infpector of the botanical garden; and

and in the following year, he obtained the degree of M.D. His health, however, began to decline; and the death of his son George so deeply impressed his mind as to aggravate his other complaints. Towards the commencement of the year 1798, his case became desperate; and before the close of this year, *viz.* on the 9th of December, his life terminated at the age of 69 years and some months. Mr. Forster's disposition was, unfortunately for his happiness and reputation, extremely irritable and litigious; and his want of prudence involved him in perpetual difficulties. The following character given of him by the celebrated Kurt Sprengel of Halle, is delineated by the partiality of a friend: "To a knowledge of books in all branches of science, seldom to be met with, he joined an uncommon fund of practical observations, of which he well knew how to avail himself. In natural history, in geography, both physical and moral, and in universal history, he was acquainted with a vast number of facts, of which he who draws his information from works only has not even a distant idea. This assertion is proved in the most striking manner by his "Observations made in a Voyage round the World." Of this book it may be said, that no traveller ever gathered so rich a treasure on his tour. What person of any education can read and study this work, which is unparalleled in its kind, without discovering in it that species of instructive and pleasing information which most interests man, as such? The uncommon pains which Forster took in his literary compositions, and his conscientious accuracy in historical disquisitions, are best evinced by his "History of Voyages and Discoveries in the North," and likewise by his excellent archeological dissertation "On the Byssus of the Ancients." Researches such as these were his favourite employment, in which he was greatly assisted by his intimate acquaintance with the classics. Forster had a predilection for the sublime in natural history, and aimed at general views rather than detail. His favourite author, therefore, was Buffon, whom he used to recommend as a pattern of style, especially in his Epoques de la Nature, his description of the horse, camel, &c. He had enjoyed the friendship of that distinguished naturalist; and he likewise kept up an uninterrupted epistolary intercourse with Linnæus, till the death of the latter. Without being a stickler for the forms and ceremonies of any particular persuasion, he adored the eternal Author of all which exists in the great temple of nature, and venerated his wisdom and goodness with an ardour and a heart-felt conviction, that, in my opinion, alone constitute the criterion of true religion. He held in utter contempt all those, who, to gratify their passions or imitate the prevailing fashion, made a jest of the most sacred and respectable feelings of mankind. His moral feelings were equally animated: he was attracted with irresistible force by whatever was true, good, or excellent. Great characters inspired him with an esteem, which he sometimes expressed with incredible ardour."

His other works, besides those above mentioned, are chiefly compilations and translations. He also communicated several papers to the Royal Society, the Academy of Sciences at Stockholm, the Imperial Academy of Sciences at Petersburgh, and other learned societies; which appear in their respective Transactions and Memoirs. Gen. Biog.

Forster, George, son of the preceding, was born at Dantzic in 1754, and accompanied his father to England, when he was about 12 years of age. At Warrington, where he studied for some time, he acquired a perfect use of the English tongue; and possessing a retentive memory and fertile imagination, he distinguished himself by his various literary and scientific attainments. We have already mentioned that he accompanied his father in the circumnavigation of the globe; and on leaving England, after their return, he wished to settle at Paris. After a temporary residence in that city, he removed, in the year 1779, to Cassel, and undertook the office of professor of natural history in the university of that place. He afterwards accepted the offer of a chair in the university of Wilna; but found no permanent satisfaction in a country where liberty was expiring under the intrigues of Russia and Prussia. Desirous of a retreat, he entered into a treaty with Catherine II., who projected a voyage of discovery round the world; but the proposed expedition was prevented by a war with the Ottoman Porte; and thus the hopes of Forster were frustrated. His active mind, however, led him to wish for useful employment; and the reputation which he had acquired induced the elector of Mentz to appoint him president of the university of that city. He hailed the dawnings of the French revolution, says M. Pougens, little apprehending, we may say, the clouds that subsequently overshadowed them; and he was deputed by the people of Mentz, who had formed themselves into a convention, to repair to Paris, and to request that they might be united to the French republic. But whilst he was thus employed, the city of Mentz was besieged and taken by the Prussian troops. By this disaster he lost his whole property, and his numerous MSS., which fell into the hands of the prince of Prussia. The domestic uneasiness of a conjugal kind, which he afterwards experienced, led him to form a resolution of visiting Hindoostan and Thibet; for which he acquired the necessary preparation, by studying the oriental languages: but the chagrin occasioned by his misfortunes aggravating a scorbutic affection, which he had contracted during his voyage round the world, prevented the accomplishment of his purpose, by terminating his existence; which event took place at Paris, February 13th, 1792, at the age of 39 years. His works are "A Voyage round the World, in his Britannic Majesty's Sloop Resolution, commanded by Captain James Cook, during the Years 1772, 3, 4, and 5," London, 1777, 3 vols. 4to. This work was translated by himself and his father into German, and published at Berlin, in 2 vols. 4to. 1778-1780. "Reply to Mr. Wales's Remarks on Mr. Forster's Account of Captain Cook's last Voyage," London, 1778, 4to. "A Letter to the Right Honourable the Earl of Sandwich," 1779, 4to. He was concerned for some time with professor Lichtenberg of Gottingen, in the publication of the Gottingen Magazine; he also wrote some papers in the Transactions of the Academy of Sciences at Upsal; he had a large share in the "Characteres generum Plantarum, &c." of his father; and was employed by professor Pallas, and others, in the continuation of Martini's Dictionary of Natural History. Account of his Life by Pougens. Gen. Biog.

Forster's *Bay*, in *Geography*, a bay of the South Atlantic ocean, on the coast of Sandwich Land, between South Thule and cape Bristol.

Forster's *Harbour*, a bay in Hudson's strait, Hudson's bay. N. lat. 62° 18'. W. long. 73° 30'.

FORSTERA, in *Botany*, so named by Linnæus a little before his death, and published by his son in the *Supplementum Plantarum*, in honour of the celebrated naturalists, John Reinhold Forster, and his son George Forster; see those articles. Linn Suppl. 59. G. Forster in Act. Nov. Upsal. v. 3.184. Schreb. 607. Willd. Sp. Pl. v.4. 147. Juss. 423. Swartz in Schrad. Journ. for 1799. 31. t. 2. and in Sims and Kon. Ann. of Bot. v. 1. 291. t. 6. (Phyllachne; Forst. Gen. t.58. Linn. Suppl. 62. Schreb. 672. Juss. 422.)

422.) Clafs and order, *Gynandria Diandria*. Nat. Ord. *Campanaceæ*, Linn.

Gen. Ch. *Cal.* Perianth double; one *inferior*, of two or three erect leaves; the other *fuperior*, of from two to fix erect leaves. *Cor.* of one petal, tubular, fomewhat bell-fhaped; tube fhort; limb in five or fix deep, equal, oblong, fpreading fegments. *Stam.* Filaments none; anthers two, feffile on the fummit of the ftyle, globofe, of one cell and two valves, which feparate tranfverfely at their outfide. *Pift.* Germen inferior, turbinate; ftyle columnar, cylindrical, erect; ftigmas two, roundifh, concealed by the concave upper valves of the anthers. *Peric.* Capfule oval, of one cell. *Seeds* numerous, inferted upon a central columnar receptacle.

Eff. Ch. Calyx double; inferior of two or three leaves; fuperior of three to fix leaves. Corolla tubular, bell-fhaped, in five or fix fegments. Capfule of one cell. Seeds numerous.

Obf. The above characters are taken from Swartz, who firft well underftood this fingular genus, as well as *Phyllachne* of Forfter and Linnæus, which he unites with it. He has hinted, and Mr. Konig in the Annals of Botany confirms the idea, that *Forftera* and fome other kindred genera, conftitute a new natural order, next to the *Campanaceæ* of Linnæus, *Campanulaceæ* of Juffieu. Thefe genera are *Lobelia*, *Goodenia*, *Scævola*, *Velleia*, *Stylidium*, and poffibly one or two more. The latter is the *Ventenatia* of Dr. Smith in his *Exotic Botany*, t. 66, 67, communicated originally by him, under the name of *Stylidium*, to his friend profeffor Swartz, who publifhed it in the Tranfactions of the Natural Hiftory Society of Berlin, and this name muft remain, there being now another *Ventenatia*.

1. F. *fedifolia*. Linn. Suppl. 407. Forft. Act. Nov. Upf. v. 3. 184. t. 9. Prod. 61.—Stems afcending. Leaves reflexed, obtufe. Flower-ftalk elongated. Outer calyx fhorteft.—Native of high mountains in New Zeeland, where it was difcovered by the botanifts whofe name it bears. The *roots* are perennial, creeping. *Stems* feveral, afcending, lax, a fpan high, fub-divided, leafy. *Leaves* loofely imbricated, tongue-fhaped, obtufe, entire, recurved, thickifh, fhining, with a broad keel. *Flower-ftalks* terminal, folitary, a finger's length, fimple, naked, fmooth, fingle-flowered. *Flower* erect, white, or flefh coloured, red in the orifice, the fize of *Androface lactea*. This is a very rare plant in herbariums, and unknown in gardens, though highly defirable, and unqueftionably hardy.

2. F. *mufcifolia*. Willd. Sp. Pl. v. 4. 148. (Phyllachne uliginofa; Linn. Suppl. 412. Forft. Magell. 32.)—Stems denfely tufted. Leaves clofely imbricated, acute. Flower-ftalk very fhort. Outer calyx longeft. Native of Terra del Fuego. In habit this pretty plant refembles a mofs, forming very compact level tufts. The *ftems* when feparated are found covered with imbricated, keeled, acute *leaves*.

The *flowers* are fmall, folitary, terminal, almoft feffile, imbedded as it were in the top leaves, white or flefh-coloured, refembling thofe of the fmalleft kinds of *Androface*, to which genus any alpine botanift would, at firft fight, fuppofe this fpecies to belong.

FORSYTHIA, in honour of the late Mr. William Forfyth, F. A. S. and F. S. A. gardener to his majefty at Kenfington, author of a Treatife on the Culture and Management of Fruit-trees. He is celebrated for the difcovery of a compofition for protecting wounded trees from the injuries of the air, and fo enabling them to heal, for which he was rewarded by parliament. This genus was named by Vahl, the original *Forfythia* of Walter, Flo. Carolin. 153, proving no other than the *Decumaria barbara* of Linnæus; fee DECUMARIA.

This was unknown to Mr. Walter, who therefore does not merit the cenfure caft on him by Vahl, of changing an eftablifhed name to no purpofe. Vahl. Enum. v. 1. 39. Clafs and order, *Diandria Monogynia*. Nat. Ord. *Sepiariæ*, Linn. *Jafmineæ*, Juff.

Gen. Ch. *Cal.* Perianth of one leaf, inferior, in four deep, lanceolate, equal fegments. *Cor.* of one petal, bell-fhaped, cut half way down into four ovate, obtufe lobes. *Stam.* Filaments two, very fhort; anthers oblong, furrowed, the length of the calyx. *Pift.* Germen fuperior, ovate, fmooth; ftyle thread-fhaped, the length of the calyx; ftigma capitate, two-lobed. *Fruit* unknown, fuppofed by Thunberg to be a capfule.

Eff. Ch. Calyx in four deep fegments. Corolla bell-fhaped, four-cleft. Fruit . . . .

1. F. *fufpenfa*, the only known fpecies. (Syringa fufpenfa; Thunb. Jap. 19. t. 3. Linn. Syft. Veg. ed. 14. 57. Mart. Mill. Dict. v. 4. Willd. Sp. Pl. v. 1. 49. Rengjo; Kæmpf. Amoen. 907.)—Native of Miaco and other parts of Japan, where alfo it is cultivated for the beauty of its flowers, which come forth in April, before the leaves, but foon fall off. It is a *fhrub*, with a climbing *ftem*, and long, trailing, oppofite, pendulous, fmooth *branches*. *Leaves* feveral from each bud, ftalked, ovate, acute, ferrated, fmooth, thin; the earlier ones fimple; the reft ternate. *Flowers* from feveral oppofite buds, towards the ends of the branches, about the fize of the bloffoms of *Halefia tetraptera*; but yellow, ftreaked internally with red, each hanging from a fimple flender ftalk, near an inch long. Willdenow juftly remarks that this plant is totally unlike the real fpecies of *Syringa*, and might well conftitute a diftinct genus, which Vahl carried into effect, though the fruit is as yet unknown to botanifts.—The *Forfythia* would be a defirable acquifition for our gardens, being doubtlefs able to bear our climate as well as the Chinefe *Hydrangea*, and calculated for decorating bowers, treillis-work, &c. If botanifts would take the pains to furnifh travellers with drawings of fuch plants, even if made but imperfectly from any drawings, plates and defcriptions that happen to exift, many valuable fpecies might ftill be obtained from China and Japan. By fuch a method, at the command of the prefent queen of Great Britain, the fragrant *Acorus gramineus*, Dryand. in Ait. Hort. Kew. v. 1. 474, frequently drawn on Chinefe papers, as cultivated in pots about houfes, was obtained, and firft made known to botanifts; except indeed that it feems to be the *Acorus Calamus* of Loureiro.

FORT, RAIMOND-JEAN, in *Biography*, called alfo in Latin *Janfortius*, a phyfician of diftinguifhed talents, by which he was raifed to the higheft rank in the profeffion, although of low origin. He was born at Verona of poor parents, who were unable to afford him any education: but a perfon of that city, who had remarked his quicknefs and defire for knowledge, procured him inftruction in reading and writing, and afterwards fent him to Padua, where he diftinguifhed himfelf among his fellow-ftudents in the claffes of humanity. This kind patron continued to fupport him alfo during his application to the ftudy of medicine, which he honourably terminated by taking the degree of Doctor. He had fcarcely quitted the fchools, however, before the death of his protector left him without refource. He repaired to Venice, where he was relieved from poverty by the commencement of a fmall, but fuccefsful practice of his profeffion. Preffed as he was by the difficulty of fubfiftence, he did not refort to the unworthy means

means of obtaining notoriety, which effrontery and intrigue often lead men to adopt in great cities; he conducted himfelf with a modefty that is ufually the concomitant of a found underftanding. By this mode of conduct he gradually acquired the reputation of one of the moft able phyficians of Venice; a character which was fanctioned by the fenate, who appointed him to the firft profefforfhip of medicine in the univerfity of Padua. This office he fulfilled to the admiration of all; for he was not lefs eloquent in his lectures, than accurate in his obfervations and prognoftics, and fuccefsful in his cures. In 1676 the emperor Leopold commanded his attendance at Vienna, in order to confult him refpecting his own health; and he gave fo much fatisfaction to that prince, that he returned to Padua loaded with magnificent prefents, and decorated with the title of medical counfellor to the imperial court. The fenate of Venice granted him the additional honour of the knighthood of the order of St. Mark, with an augmentation of his ftipend, and likewife appointed him honorary profeffor of Padua. He did not however long enjoy thefe well-merited honours, for he died at Padua on the 26th of February, 1678, in the 75th year of his age.

This phyfician was the author of feveral practical works, of which the following are the titles. 1. "Confilia de Febribus et morbis Mulierum facilè cognofcendis et curandis," Patavii, 1668, folio. 2. "Confultationum et Refponfionum Medicinalium centuriæ quatuor," tomus primus, Patav. 1669. fol. Geneva, 1677. 3. A fecond volume of the fame book, at Padua, 1678. And 4. "Confultationes et Refponfiones Medicinales," in two volumes, folio, Padua, 1751, which comprehends the two preceding works.

Fort, Francis le, was defcended from a noble family of Geneva, where he was born in 1656, and entered at an early age into the military fervice of France. He afterwards ferved as a volunteer in Holland, and was wounded at the fiege of Grave. For the fake of preferment he joined a German colonel, who was enlifting a body of men for the czar Alexis of Ruffia. They arrived at Archangel, and were expofed to extreme danger and want. Le Fort, however, contrived to get to Mofcow, and was by his addrefs immediately appointed fecretary to the Danifh refident. He applied himfelf to, and foon acquired, the languages neceffary to his new fituation, and attracted the notice of feveral perfons of diftinction, and finally of the young czar Peter. In him he found a patron, and Le Fort was precifely the perfon wanted to affift the prince in his efforts to raife himfelf and his country from that ftate of barbarifm in which it was involved at this period. He was immediately promoted to a captain's commiffion, and was admitted to the confidence of the fovereign. He was employed to raife a body of 12,000 men, and was made their general. Though perfectly unacquainted with naval affairs, he was, foon after, created an admiral, and his activity rendered him very ufeful in forming the commencement of that marine which was the favourite object of the czar's life. Fort was appointed in 1696 to conduct the fiege of Afoph, in which he gained fo much reputation that the czar immediately invefted him with the chief command of all his troops both by land and by fea. He was appointed to the government of Novogorod, and to the principal poft in the miniftry. When Peter determined upon travelling for his own improvement, he fent Le Fort embaffador to the courts which he intended to vifit, and went as a private perfon in his fuite. Though he was ever in high efteem with his mafter, yet he once narrowly efcaped with life, the czar having, in a fit of paffion, drawn his fword upon him. When Peter was returned to his recollection he expreffed the moft unfeigned forrow for what had happened, and Le Fort retained his favour till his death, in 1699. The czar honoured him with a public funeral, and followed in the proceffion as a military officer. Le Fort was not a man of extenfive knowledge when he was introduced into the Ruffian fervice, but he had the feeds of great talents in him, which developed themfelves in proportion to his advancement: and he had feen enough of the world to be able to fuggeft plans on which the improvement of the country depended. Moreri.

Fort, a little caftle or fortrefs; or a place of fmall extent, fortified by art or nature, or both.

A fort is a work encompaffed round with a moat, rampart, and parapet, to fecure fome high ground, or paffage of a river; to make good an advantageous poft; to fortify the lines and quarters of a fiege.

Fort, *Field*, otherwife called *Fortin* or *Fortlet*, and fometimes *Sconce*, is a fmall fort, built in hafte, for the defence of a pafs or poft; but particularly conftructed for the defence of a camp in the time of a fiege, where the principal quarters are ufually joined, or made to communicate with each other, by lines defended by fortins and redoubts. Their figure and fize are various, according to the nature of the fituation, and the importance of the fervice for which they are intended. Some are fortified with baftions, and fome with demi-baftions. A fort differs from a *citadel*, (which fee,) as this laft is erected to command and guard fome town; and from a redoubt, as it is clofed on all fides: whereas a redoubt is open on one fide. Forts are moft commonly made fquare (fee *Plate* IV. *Fortification*, *fig.* 4.) efpecially when the pafs they are to guard is of any confequence, or the place may eafily be approached: the fides of this fquare are a hundred toifes, the perpendicular ten, and the faces twenty-five; the ditch about this fort may be from ten to twelve toifes; the parapet is to be made of turf, and fraifed, and the ditch palifadoed when dry. There may be made a covert-way about this fort, or elfe a row of palifades might be placed on the outfide of the ditch. A fquare fort may be fortified in the following manner: having infcribed the fquare in a circle, divide each of its fides, A B, B D, &c. into two equal parts in the points F, M, &c. from the centre E draw an indefinite line E F; from the centre draw alfo the lines E A, E B, E D, E C, to the angles of the fquare; divide the fide A B into eight equal parts, and fet off one of thefe parts from F to G, and from G draw the lines of defence A G, B G; divide another fide of the fquare into feven equal parts, and fet off two of thofe parts from A to K, and from B to L, which will be the faces of the baftions; take the diftance K L in your compaffes, and fet it off on the lines of defence from K to H, and from L to I, and draw H I, which will be the curtin, and the lines K I, L H, will be the flanks. Or, it may be otherwife fortified thus: let the fide A A (*fig.* 5.) be a hundred and thirty fathoms; the demi-gorge A B twenty-five fathoms; and with the compaffes opened to the length of the pinched line B C B, which is the diagonal of two fides, from each of which there has been taken twenty-five fathoms, upon the extremity oppofed to the angle which they form, defcribe two arcs above the angle of the figure, alternately making ufe of the points B for centres; then draw lines from the points of interfection of the arcs D, to the point which ferved for centres B, upon which points B, raife the flanks B E perpendicular to the oppofed lines of defence B D.

Fort *paine, & dure*. See Paine.

Fort *royal*, is a fort whofe line of defence is at leaft twenty-fix fathoms long.

Fort,

Fort, *Star*, is a sconce or redoubt, constituted by re-entering and saliant angles, having commonly from five to eight points, and the sides flanking each other.

To describe a star-fort.—Describe a hexagon *a* B C *d e f* (*fig.* 6.); divide one of its sides into four equal parts; and on the centre of this side raise the perpendicular D A equal to one fourth of the side B C. From the point A draw the faces A C and A B, and let the same operations be performed with respect to the other sides of the hexagon.

Forts are sometimes made triangular, only with half bastions, as in *fig.* 7. This, as well as the square and pentagonal fort, (*figs.* 8. and 9.) may be described in the following manner. Parallel to the inner figure, whether it be a triangle, square, or pentagon, whose side A B may be supposed about eighteen yards, describe an outward figure at the distance of about four or five yards from it, or farther, if necessary, whose sides are E D, E F, &c. Divide each side, as E D, E F, &c. into three equal parts, one of which is E I, F L, &c. and in these sides prolonged, take D G, E H, &c. each equal to one of those three parts. From the points G, H, &c. thus found, draw the lines of defence to the angles of the outward figure, as H D, &c. and from the points I, L, &c. draw the flanks I K, L M, &c. perpendicular to the sides E D, E F, meeting the lines of defence in K, M, &c. Or the flanks may be drawn, by continuing the line D I towards E, and taking I P equal to twice I E; from P as a centre, with the radius P I, cut the line of defence in K, and draw the flank I K. Then to each face H K, flank K I, and curtin I G, make a parapet of about seven feet thick, or more if necessary, expressed in the figures, by drawing lines at that distance on the inside of the several parts. Leave a proper berm of about four or five feet broad, and make a ditch about five or six yards wide, whose outer line or counterscarp is to be parallel to the faces and curtins only. A fort thus constructed is more capable of defence than one without flanks: for the curtin I G is defended by the flank I K; and the face H K has some defence from the part D G. In the construction of triangular forts, (*fig.* 10.) instead of making half bastions at the angles, whole ones are placed in the middle of the sides. The gorges of these bastions may be from twenty or twenty-four toises, when the sides are from a hundred to a hundred and twenty; the flanks are perpendicular to the sides, from ten to twelve toises long, and the capitals from twenty to twenty-four. If the sides happen to be greater or less, the parts of the bastions are likewise made greater or less in proportion: the ditch round this fort may be ten or twelve toises wide. The ramparts and parapets of these works are commonly made of turf, and the outside of the parapet fraised. Forts are often made of various figures, regular or irregular, and sometimes in the form of a semi-circle, especially when they are situated near a river, sea, or at the entrance of a harbour; by which figure they are able to fire at the ships on all sides. When a fort is to be built on a neck of land formed by the confluence of two rivers, or in the windings of a river, in order to prevent an enemy from transporting any thing by water, or to prevent their ships passing that way, the figure of the fort must be adapted to the situation, in such a manner, that there may be no place for landing troops out of the reach of the fire of some work or other; and the side next to the land should always be better fortified than the other parts near the river, as being more liable to an attack. There are two principal errors committed in the construction of forts near the sea, or navigable rivers, which should be carefully guarded against; the one is, that of making the parapet too low, so that persons behind it may be fired upon from the round top of a mast, by which the gunners are obliged to abandon their guns, and save themselves by flight: to remedy this inconvenience, the parapet should be nine or ten feet high, and the batteries may be covered above by making an arch over every piece, left open behind to let out the smoke, or with planks, like sheds, over which may be scattered earth or dung about a foot and half thick, to prevent the wood from taking fire.

The other fault is, leaving forts or batteries open behind, or very little fortified towards the land, so that the enemy may land men in the dark and surprize them, by which the guns placed in them become not only useless, but serve rather to destroy them. A fort, or battery, therefore, should be fortified all round with a good rampart and ditch, at least, or with an addition of outworks, if the place is of any importance: the rampart should be fraised, and the ditch have a row of palisades planted in the middle of it, if it be dry. In the construction of all forts, it should be remembered, that the figure of fewest sides and bastions, that can probably answer the proposed defence, is always to be preferred; as works on such a plan are sooner executed, and with less expence: besides, fewer troops will serve, and they are more readily brought together in case of necessity. See *Military* Construction.

Forts, *Vitrified*, structures of a singular kind, occurring in the Highlands and northern parts of Scotland, the walls of which seem to have been melted into a solid mass, resembling the lava of a volcano. Mr. Williams, an engineer, suggests, in a treatise upon the subject, that these walls are the works of art; whilst others are of opinion, that they should be traced to a volcanic origin. These buildings are commonly situated on the summits of small hills, commanding extensive views of the adjacent vallies or of the country below them. The area on the eminence, varying in extent, as some have supposed, in proportion to the number of cattle which the proprietor had to protect, or the dependents he was obliged to accommodate, was surrounded with a high and strong wall, the stones of which were for the most part entirely melted; while others, which are not so completely fused, are so far sunk in the vitrified matter as to be quite inclosed in it; and the fusion of some has been so perfect, that the ruins resemble masses of coarse glass. Among those who allow these vitrified structures to be artificial works, some maintain that they were vitrified for the purpose of cementing the materials together; whilst others think that the vitrification is accidental. Mr. Tytler, in his dissertation, suggests that these forts were constructed, not only before the Roman invasion, but before the introduction of the Druidical rites into Britain.

Fort is also used as a *geographical* appellative in various instances; some of which we shall recite.

Fort *Amsterdam*, a fortress of Africa, on the Gold coast, near Little Cormantin, whence the English were expelled by the Dutch in 1665.

Fort *Ann*. See Ann.

Fort *Augustus*. See Augustus.

Fort *des Autels*, a fort of France, in the department of the Channel; four miles N.W. of Cherburg.

Fort *Badenstein*, a fort of Africa, on the Gold coast, belonging to the Dutch.

Fort *Barnevelt*, a fort on the south coast of the island of Bachian, garrisoned by the Dutch. See Bachian.

Fort *Barrington*, a town of America, in Georgia, on the coast of the Atlantic; 50 miles S.S.W. of Savannah. N. lat. 31° 30′. W. long. 81° 55′.

Fort *La Bay*, a fort on the southern extremity of a bay in lake Michigan, denominated by the French the "bay of

of Puants," but called by the English, since they have had possession of it, the "Green bay," from its appearance. It is surrounded by a stockade, and garrisoned by the English with an officer and 30 men.

Fort *Bourbon*. See Bourbon.

Fort *de Broto*, a fort on the N. coast of Sicily; nine miles W.N.W. of Pati.

Fort *Chamblee*. See Chamblee.

Fort *Charles*, a fort at the S.W. extremity of the island of Barbadoes, S. of Bridge-town, and terminating Charles's bay.

Fort *Charlotte*, a fort on the island of Shetland or Mainland, first built by Oliver Cromwell, to defend the town and harbour of Lerwick; its name was given to it in 1781, when it was repaired and garrisoned: one mile N.W. of Lerwick.

Fort *Chippeway*. See Chippeway.

Fort *Christiansburg*. See Christiansburg.

Fort *Church-hill*. See Church-hill.

Fort *Clarendon*, a fort on the western side of the island of Barbadoes, between Speight's town and Hole town.

Fort *Conde de la Mobile*, a fort of West Florida, at the N. extremity of Mobile bay. N. lat. 30° 34'. W. long. 88° 2'.

Fort *Crevecœur*, a fort of Africa. See Crevecoeur.—Also, a fort of America, in West Florida, in St. Joseph's bay. N. lat. 29° 51'. W. long. 85° 30'.

Fort *Culonge*, a fort of Lower Canada, on the Utawas; 170 miles W. of Montreal.

Fort *Cumberland*. See Cumberland.

Fort *Dauphin*, a sea-port of the island of Hispaniola, in the West Indies, situated on the N. side of the island, with a spacious harbour. N. lat. 19° 42'. W. long. 72° 40'. See Dauphin.

Fort *Delagarta*, a fort on the coast of Portugal; seven miles N.N.W. of Viana.

Fort *Detroit*. See Detroit.

Fort *Edward*, a town of America, in New York, so called from its fortifications, now dismantled; 33 miles N. of Albany.

Fort *Erie*. See Erie.

Fort *de Estrica*, a fort of Portugal, in the province of Entre Duero é Minho; 20 miles N. of Braga.

Fort *di Faro*, a fort and light-house, on the N.E. coast of Sicily. N. lat. 38° 15'. E. long. 16°.

Fort *de Ferrières*, a fortress of France, in the department of the Tarn; 10 miles E. of Castres.

Fort *Fontanelle*, a fort of Barbadoes, in St. Michael's parish, on the W. coast N. of Bridge-town.

Fort *Franklin*, a fort of America, in Pennsylvania, erected in 1787, at a place formerly called "Venango," on the Alleghany river, 46 miles S. of lake Erie. N. lat. 41° 23'. W. long. 79° 50'.

Fort *Frederick Henry*, a fort of Brabant, at the mouth of the Scheldt; 10 miles N.W. of Antwerp.

Fort *Frontenac*, a fort of N. America, in lake George, taken from the French in 1756, though defended by 60 pieces of cannon, and 100 men, besides Indians.

Fort *de Fuentes*, a fortress of Italy, at the place where the Adda enters the lake of Como; destroyed by the French in 1796; 30 miles N. of Como.

Fort *Galet*, a fortress on the coast of France; half a mile N. of Cherburg.

Fort *George*, a regular fortification of Scotland, in the county of Inverness, situated on a long and narrow neck of land called "Ardarsier," surrounded on three sides by the sea, covering ten acres, begun in the year 1747, and completed in twenty years at an expence of 160,000*l.* It is capable of containing 10,000 men, with barracks for 6000. It mounts 100 cannon, mostly 42-pounders; 11 miles N.E. of Inverness.—Also, a fort of America, in New York, at the south extremity of lake George; 42 miles N. of Albany.

Fort, *Half-moon*, a fort of Barbadoes, on the W. coast, N. of Speight's-town.

Fort, *Hallets*, a fort of Barbadoes, on the W. coast in the parish of St. Michael, N. of Bridge-town, and near Fontanelle fort.

Fort *Hamilton*, a fort of the western territory of America, on the Meami. N. lat. 39° 18'. W. long. 84° 50'.

Fort *Hardy*, a fort of America, in the state of New York; 25 miles N. of Albany.

Fort, *Haywood's*, a fort of Barbadoes, near Speight's-town.

Fort *de Hue*, a fort of France, in the department of the Channel; three miles E. of Cherburg.

Fort *Hommet*, a fort of France, in the department of the Channel; two miles N.W. of Cherburg.

Fort *James*, a fort of Africa, on the Gold coast.

Fort *Jefferson*, an American fort in Kentucky, on the Mississippi. N. lat. 36° 36'. W. long. 89° 46'.—Also, a fort in the western territory of America, on White river. N. lat. 39° 58'. W. long. 85° 25'.

Fort *Knox*, a fort in the western territory of America; on White river. N. lat. 39° 37'. W. long. 85° 10'.

Fort *Leon*, a fort of Louisiana, on the Mississippi; five miles S. of New Orleans.

Fort *Lessa*, a fort on the W. coast of Portugal; five miles N.W. of Oporto.

Fort *Leydsaambeyde*, a Dutch fort on the Gold coast.

Fort *Ligonier*, a fort of America, in Pennsylvania, 36 miles E. of Pittsburg. N. lat. 40° 16'. W. long. 79° 15'.

Fort *Longlet*, a fort on the coast of France, near Cherburg.

Fort *Louis*, now called *fort Vauban*, a fortress of France, in the department of the Lower Rhine, built by Louis XIV. on an island formed by the Rhine; 18 miles N.N.E. of Strasburg.—Also, a fort of Senegal, built by the French, but taken in 1758 by the English.—Also, a fort on the south coast of Hispaniola.

Fort *Marlborough*. See Bencoolen.

Fort *Mackintosh*, a fort of America, in Pennsylvania, on the Ohio; 22 miles N.W. of Pittsburg. N. lat. 40° 42'. W. long. 80° 21'.

Fort, *Maywek's*, a fort of Barbadoes, in St. Lucy's parish, N. of Speight's-town.

Fort *Meami*, a fort of N. America, on the Meami. N. lat. 41° 20'. W. long. 84° 56'.

Fort *Medoc*, a fort of France, on the river Garonne, opposite to Blaye.

Fort *Mirabouc*, a fort of France, in the department of the Po; 10 miles W. of Pincrolo.

Fort *Moose*, a fort at the south end of St. James's bay, in Hudson's bay, at the mouth of Moose river.

Fort *Nassau*, a fortress of Brabant, on the Scheldt, between Tolen and Berg-op-zoom.—Also, a fortress of Africa, on the coast of Guinea, with a good harbour, built by the Dutch in 1612.—Also, a fort on the north coast of the island of Timor.—Also, a fort on the island of Cadsand.

Fort *Nieulet*, a fortress of France, near Calais and the sea, serving to guard the sluices.

Fort *Omonville*, a fort of France, on the N. coast of the department of the Channel; eight miles W.N.W. of Cherburg. N. lat. 49° 43'. W. long. 1° 44'.

Fort *Oſwegatchy*, a fort of Upper Canada, on the S. ſide of the river St. Lawrence; 60 miles N.E. of lake Ontario.

Fort *Panmure*, a fort of America, in the country of the Natches.

Fort *Patience*, a fortreſs of Flanders, on the coaſt oppoſite to Zealand, between Sas de Ghent and Yſendick.

Fort *Penthievre*, a fort of France, in the department of the Morbihan, ſituated on the peninſula of Quiberon; 15 miles S.E. of L'Orient. N. lat. 47° 33'. E. long. 3° 3'.

Fort *Philippe*, a fortreſs of France, in the department of the North; 2 miles from Gravelines.

Fort *Portage*, a port of Upper Canada, on the river Utawas; 120 miles W. of Montreal.

Fort *de Porto de Cam*, a fort on the weſt coaſt of Portugal, near the Atlantic; 6 miles N.N.W. of Viana.

Fort *de Porta*, a fort on the weſt coaſt of Portugal, near the Atlantic; 5 miles N. of Viana.

Fort *de Povoa*, a fort of Portugal, in the province of Entre Duero é Minho; 1 mile N. of Villa de Conde.

Fort *Queen*, a fort of Barbadoes; 1 mile N. of Hole town.

Fort *Querqueville*, a fort of France, in the department of the Channel; 3 miles N.W. of Cherburg.

Fort *de Rego de Foz*, a fort on the weſt coaſt of Portugal, near the Atlantic; 2 miles N.W. of Viana.

Fort *Royal*, a fort of Africa, built by the Danes, and called "Frederickſburg;" but its name was changed when the Engliſh became the poſſeſſors of it.—Alſo, a town of the iſland of Martinico, ſituated on the ſouth coaſt. N. lat. 14° 34'. W. long. 61°.—Alſo, a fort built by the French on the weſt coaſt of the iſland of Martinico.—Alſo, a town, called "St. George," ſituated on a ſpacious bay on the weſt coaſt of the iſland of Grenada, and capital of the iſland. This town poſſeſſes one of the ſafeſt and moſt commodious harbours for ſhipping in the Engliſh Weſt Indies, and has been not long ago fortified at a very great expence. It is built chiefly of brick, and divided by a ridge, running into the ſea, and forming on one ſide the "Carenage," and on the other the bay: ſo that there is the "Bay-town," with a handſome ſquare and market-place; and the "Carenage-town," in which the merchants principally reſide; the ſhips lying land-locked, and in deep water, cloſe to the wharfs. On the ridge ſtands the church, and on the promontory above it is a large old fort, built of ſtone, and large enough to accommodate an entire regiment. N. lat. 12° 4'. W. long. 61° 32'.

Fort *St. Anthony*, a fort of Africa, on the Gold coaſt, in the country of Axim, belonging to the Dutch.

Fort *St. Catalina*, a fort of Portugal, in the province of Beira; 2 miles S. of Villa Nova de Moncarras.

Fort *St. David*, or *Tegapatam*, a fortreſs of Hindooſtan, on the coaſt of Coromandel, ſeated on a branch of the river Panaur, in a ſmall tract of country bought of a Mahratta prince for 30,000*l.*, and firſt built in the year 1686, for the uſe of the Engliſh Eaſt India company, and much ſtrengthened about the year 1750 by Mr. Robins. It is the ſtaple of this country for fine dimities and painted cottons. About four miles from the fort is a famous Indian fig-tree, under the ſhadow of which it is ſuppoſed 10,000 perſons may ſtand without inconvenience; 1 mile N. of Cuddalore.

Fort *St. Donas*, a fortreſs of Flanders, built by the Spaniards, between Dam and Sluys.

Fort *St. George*. See Madras.

Fort *St. Joſeph*. See Gallam.

Fort *St. Julian*, a fort of Portugal, on the north ſide of the mouth of the Tagus; 9 miles below Liſbon.

Fort *St. Julien*, a fort of Egypt, on the left branch of the Nile, between Roſetta and the ſea.

Fort *St. Lucar*, a fort of Braſil, at the mouth of the river Jaguaripe. S. lat. 4° 2'.

Fort *de St. Martino*, a fortreſs of Etruria, built by Coſmo the Great, on a mountain near the river Sieve; 10 miles N. of Florence.

Fort *St. Martin de Ré*, a fortreſs of France, in the iſland of Ré, near the town of St. Martin.

Fort *St. Mary*, a fortreſs on the eaſt coaſt of the iſland of Guadaloupe.—Alſo, a fortreſs of Genoa, on a rock nearly ſurrounded by the ſea.—Alſo, a fort of Weſt Florida, on the eaſt ſide of the river Miſſiſſippi; 6 miles S.E. of New Orleans.

Fort *St. Michel*, a fortreſs of Spain, in Eſtramadura, near the town of Badajoz.—Alſo, a fortreſs of France, on the Meuſe, oppoſite to Venlo.

Fort *St. Nicolas*, a fortreſs of Dalmatia, near the town of Sebenieo.

Fort *St. Philip*, a fortreſs of the iſland of Minorca, ſituated on a rock near the coaſt, to defend port Mahon.—Alſo, a fortreſs of the iſland of Tercera, near the town of Angra.

Fort *de St. Tiago*, a fort of Portugal, on the coaſt of the Atlantic, in the province of Entre Duero é Minho; 7 miles N.N.W. of Viana.

Fort *St. Yago*, a town of South America; 10 miles N. of Cumana.

Fort *Saſlingue*, a fort of Flanders, on the Scheldt, between Hulſt and Berg-op-zoom.

Fort *Schloper*, a fort of Upper Canada, near the falls of Niagara.

Fort *Sinclair*, a fort of America, on the right bank of the river Hudſon. N. lat. 43° 15'. W. long. 82° 21'.

Fort *Stanwix*, a ſmall ſquare log fort, in the ſtate of New York, defended with four baſtions, and a ſtockaded covert way, without any other out-works.

Fort *Tete*, a fort and town of Africa, in Mocaranga, on the Zambeſe. S. lat. 16° 5'. E. long. 33° 3'.

Fort *Trinité*, a fort on the weſt coaſt of the iſland of Martinico.

Fort *de Verchercs*, a fort of Canada, which took its name from that of a French lady who defended it in 1690, when it was attacked by the Iroquois Indians.

Fort *Urbino*, a fortreſs of Italy, in the department of the Amona; 13 miles E. of Bologna.

Fort *Wallis*, a fortification of the United States of America, on the North river, connected with Weſt point.

Fort *Waſhington*, a fort on the iſland of New York, on the eaſt ſide of Hudſon's river.—Alſo, a fort in the weſtern territory of United America, on the right bank of the Ohio; 10 miles W. of Columbia. N. lat. 38° 57'. W. long. 84° 45'.

Fort *Wedenburg*, a town of Africa, on the Gold coaſt.

Fort *Wentworth*, a fort of New Hampſhire, on the Connecticut. N. lat. 44° 32'. W. long. 71° 30'.

Fort *William*, a ſmall fortreſs of Scotland, in the county of Invernefs, built in the reign of king William III. on the ſcite of a fort conſtructed by Cromwell, in a plain, on a navigable arm of the ſea, called Loch Eil, near the influx of the Lochy and Nevis. Although this is not a ſtrong place, it was gallantly defended againſt the rebels in 1746. Several years ago, a fourth part of the wall was undermined and ſwept away by the Nevis; nor is there any proſpect of its being repaired. It is occupied by a company of invalids. The village in its neighbourhood is called Maryborough.

 A mile

A mile thence, at the mouth of the Lochy, is Inverlochy castle, at the foot of Benevish, a mountain 4,370 feet above the level of the sea. A post-office was established at Fort William in 1764; 130 miles N. of Edinburgh. N. lat. 56° 48′. W. long. 5° 6′.

Fort *William*. See Calcutta.

Fort *William-Henry*, a fort of America, in Pennsylvania, at the foot of the Blue Mountains; 20 miles N.W. of Reading.

Fort, *Fr.* loud; *temps fort*, the accented part of a bar, in *Music*. See Accent, Tact, and Trine.

FORTAMENTE, in the *Italian Music*, the same with forte.

FORTAVENTURA, or Fuerte-ventura, in *Geography*, one of the Canary islands, about 50 miles long, and from 8 to 24 broad. The soil is in general fertile in corn, roots, and fruits, and beautifully diversified with hills and vallies, well watered, and supplied with a variety of timber. This island produces, besides the other fruits common to the Canaries, abundance of dates, mastic, and olives, with archil for dyeing, and a species of fig-tree, that yields a medicinal balm, as white as milk, but of virtues unknown in Europe. In Fortaventura a great quantity of goat-milk cheese is made; the island breeding annually more than 50,000 kids, each of which weighs between 40 and 50 pounds. The flesh is fat, better coloured, and sweeter than in any other country. The principal towns of this island are La Villa in the centre, and Olivia near the northern extremity; on the east coast there are also three sea-ports, called Langla, Tarrafata, and Pozzo Negro; and there are several villages. The number of inhabitants is about 10,000. The climate of this island and Lancerotta is exceedingly salubrious. N. lat. 28° 4′. W. long. 14° 32′.

FORTE, *Ital.* loud, in *Music*. This term is used in the several instrumental parts of a musical composition, for enforcing the tones of a passage; to sing loud, put out the voice, produce or draw a great degree of sound from an instrument. It is likewise used to annul the effect of a preceding piano.

FORTE-PIANO, an Italian compound substantive, of the same import, in music, as chiaro-scuro in painting. Forte-piano is the art of enforcing or enfeebling sounds in imitative melody, as is done in speech, which it imitates. We not only speak with different degrees of force, when animated and impassioned, but when calm and tranquil. Music, in imitating various accents and tones of speech, should imitate the intensity and remission, and be sometimes loud, sometimes soft, and sometimes in a whisper; and this is what the Italians in general mean by forte-piano. These two words, transposed, imply the keyed instrument, which, from its power over loud and soft, at the pleasure of the performer, is called a *Piano-forte*, which see, and Harpsichord.

FORTESCUE, *Sir* John, in *Biography*, an English judge, third son of sir Henry Fortescue, lord-chief-justice of Ireland, was born in the parish of Wear Gifford in Devonshire, from whence he removed to Lincoln's Inn, and was made serjeant at law in 1430, he having already distinguished himself as a sound lawyer, and an excellent lecturer on the laws. In 1442 he was elevated to the chief justiceship of the king's-bench, and was probably the principal adviser of Henry VI., to whom, in all his misfortunes, he faithfully adhered. When the success of Edward IV. obliged Henry to take refuge in Scotland, Fortescue attended him, and it was at this period he was created chancellor of England. For his general attachment to the interests of his master, he was in 1461 attainted of high treason, and another person appointed chief justice in his stead. He was never acknowledged chancellor by Edward's government, nor did he ever exercise the office in England. In 1463 he accompanied queen Margaret, prince Edward, and others of the adherents of the house of Lancaster, in their flight to Flanders, and passed many years upon the continent as an exile. In this situation he composed his celebrated work, entitled "De Laudibus legum Angliæ," addressed to prince Edward, son of Henry VI. with the express purpose of giving him just notions of the laws and constitution of his country. This work was not published till the reign of Henry VIII. since which period it has gone through many impressions; the best edition is said to be that of 1775, with notes by Mr. Gregor. When the affairs of the house of Lancaster seemed to take a turn, he, in company with the queen and prince, came to England, and was taken prisoner after the battle of Tewkesbury in 1471, which annihilated the hopes of the house of Lancaster. Edward released and pardoned him, but probably not till he had written or promised to write a retractation of a paper he had formerly composed and circulated against the right and title of the house of York. After this he lived in retirement, and in his privacy drew up a work in English, on "The difference between an absolute and limited Monarchy, as more particularly regards the English constitution." He wrote some other treatises which have never been made public. He lived to the age of ninety; the time of his death is not exactly ascertained, but he was interred in the parish church of Ebrighton in Gloucestershire, of which place he possessed the manor. His work "De Laudibus legum Angliæ," is written in Latin in the form of a dialogue, and is a valuable record of the grounds and principles of the laws of England as they were understood at that time, and of various circumstances relative to the mode of education in the inns of court. It is, however, rather a panegyric of the common law than a fair comparison of it with the civil or other foreign systems. His other work, "On the Difference between an absolute and limited Monarchy," first published by lord Fortescue, in 1714, was chiefly a repetition in English of what is said in the other piece concerning the constitution of England, with the addition of some observations meant for the service of king Edward. Biog. Brit.

Fortescue *Bay*, in *Geography*, a bay of South America, in the straits of Magellan. S. lat. 53° 39′. W. long. 73° 22′.

FORTESSA, an island in the gulf of Venice. N. lat. 44° 40′. E. long. 14° 48′.

FORTH, one of the most considerable rivers in Scotland, rises out of two lakes at the foot of a mountain called Ben Lomond, in the shire of Dumbarton, and running nearly from west to east, the whole breadth of this part of the island, almost divides it into two parts. The length of the Forth, from the source to its confluence with the German ocean in a direct line, is upwards of ninety miles; but so sinuous is the course, that calculating its various windings, the distance cannot be less than two hundred and fifty. This characteristic the river assumes when only an inconsiderable rill, whilst it winds through the mountains, collecting the tributary streams. Having received a large supply of water from the rivers Teuth, Ardoch, and Allan, it enters the extensive plain termed the Carse of Stirling, about six miles westward of that town. Of its sinuosity here some idea may be formed, when it is known that the distance from Stirling to Alloa by land is only six miles; but by water twenty-four. It here seems as if unwilling to leave the country, prolonging its stay by lengthening its course; which

 Gilpin

Gilpin fo ftrikingly defcribes. "In this finuous navigation, were the mariner to truft entirely to the fails, he would have to wait for the benefit of every wind round the compafs feveral times over." In thefe meanders it forms numerous peninfulæ, on one of which, oppofite to the caftle of Stirling, ftands a ruined tower, the only remaining veftige of the abbey of Camburkenneth, formerly the moft wealthy monaftery in the kingdom. The turnings and windings of the river through a rich and diverfified country, the numerous manfions on its margin, the white fails of the veffels mingling with the trees in every direction, form a coup d'œil of interefting and picturefque fcenery. After paffing Alloa, it expands into a bay near twenty miles long, and of confiderable breadth; which being fhut in by the contraction of the river at Queen's ferry, where it is not more than two miles wide; and ftill further by the fmall fortified ifland of Inchgarvie, fituated in its channel; forms one of the fineft roadfteds in the ifland. Thence expanding into a frith, with feveral fmall iflands, and on one of which, May, a light-houfe is erected, it forms feveral excellent harbours, both on the northern and fouthern banks; particularly Leith roads, where it is nine miles over; and wafhing the fhores of Haddington and Fife, falls into the German ocean. The river abounds with various kinds of white fifh, and feveral valuable falmon fifheries are eftablifhed in the upper part of its courfe; particularly at Alloa, Kincardine, Torryburne, and Culrofs: and the frith ufually receives an annual vifit of a fhoal of herrings, equal to thofe frequenting other parts of the eaftern coaft. The Forth is navigable up to Stirling bridge for veffels of eighty tons, and for merchant veffels of any draft of water as far as Grangemouth, where it is joined by the canal, uniting this river with the Clyde. From this communication, the numerous harbours on the coafts of the frith, and the inexauftible ftores of coal, iron ore, and lime-ftone, as well as the manufactures of the counties of Perth, Fife, Stirling, and the two Lothians, occafion fuch a refort of veffels, that the tonnage of the Forth nearly rivals the Thames.

Forth and *Clyde canal*, is a navigable cut, which, connecting the rivers Forth and Clyde, forms a junction between the German ocean and the Irifh fea. The utility of conjoining large rivers, for the purpofe of extending their navigation, muft be obvious to every reflecting mind, and in no inftance did the geographical features of the country, and the circumftances which imperioufly called for the execution of fuch a work, appear more ftriking than in this. The two rivers appeared to look with wifhful eyes towards each other, and a natural paffage prefented itfelf through the mountains for conducting the union canal. Previous to this being made, the trade of this poffeffed no channel with the other fide of the ifland, but by immenfe maritime diftance round the Land's End; or by the lefs circuitous route, but dangerous paffage of Pentland frith. Such an idea was conceived fo early as the reign of Charles II., and the fcheme met with fome confideration; but that was not an age for this kind of national improvement. It then lay dormant till the year 1723, when a furvey was made of the line of country by Mr. Gordon; ftill the undertaking was declined by the confideration of the expence. It was again revived in 1762; and a furvey made by a Mr. Mackell, and another by Mr. Smeaton in 1764. From thefe furveys the practicability of the plan was afcertained, but its eligibility was yet queftioned on the ground of the eftimated expence, eighty thoufand pounds. In the mean while a fmaller canal was projected to extend from Glafgow to the Forth; parliament, however, refufed to fanction the fcheme on account of the fmallnefs of the fcale. Mr. Smeaton was then called in again to make a furvey and eftimate for cutting a canal, of fuch a breadth and depth, as would admit coafting veffels to pafs from fea to fea. A fubfcription was accordingly opened, a bill obtained for leave to execute the plan, and the whole being placed under the direction of the able engineer who furveyed the ground, the undertaking commenced on July 10, 1768. After expending 150,000*l.* and overcoming difficulties which feemed at firft infurmountable, it was rendered navigable as far as Stockingfield, where a branch, called Monkland, extends to the collieries to the eaft of Glafgow. The fubfcription and an additional loan having been exhaufted, the work was here ftopped, and in this ftate it remained till the year 1784, when the company, having obtained 50,000*l.* by forfeited eftates, and an act of parliament for varying the line, Mr. Robert Whitworth, being appointed engineer, began to profecute with great vigour and effect the further execution of the original plan. On the 28th of July, 1790, this immenfe undertaking was completed, and the navigation opened from fea to fea. Thus, with the aid of the collateral branch, a communication is formed between the great emporium of the north, Glafgow, and both fides of the ifland. The whole length of the canal is thirty-five miles from the mouth of the river Carron, to Dalmoreburn-foot, on the banks of the Clyde; rifing and falling 160 feet, by means of 39 locks. In its courfe it paffes over rocks, through precipices, deep moffes, over quick-fands, and in places is guarded by banks twenty feet high; croffes two confiderable rivers, the Kelvin, and Luggie, with numerous rivulets and ftreams, by 10 large, and 33 fmaller aqueducts or water bridges. That over the former river is a grand object, confifting of feveral arches, the centre one of which is 90 feet, forming an arcade 420 in the fpan in length, and 65 feet high. Various roads alfo traverfe the canal by the aid of 33 draw-bridges. The dimenfions of it, though greatly contracted from the original defign, are far fuperior to any work of the kind in South Britain. The Englifh canals are in general from three to five feet deep; from 20 to 30 feet wide; and the lock gates from ten to twelve feet; fufficiently capacious however to anfwer the purpofes of inland carriage, from one town to another, for which they were exclufively defigned. The following particulars will enable the reader to inftitute a comparifon.

	Feet.
The medium width of the furface - -	56
Do. of the bottom - - -	27
Depth on the average from fea to fea -	8
The fall of each of the 39 locks -	8
The breadth of each lock - -	20
The length of do. between the gates -	74

The contrivance for fupplying the canal with water was alone a difficult and arduous undertaking. No lefs than fix refervoirs were found expedient; one near Kylfith covers a furface of 50 acres of land; another confifts of 70; and the whole occupy about 409, containing by meafurement 12,679 lockfulls of water. The expence of the whole concern amounted to 300,000*l.* The toll for the whole line is 5*s.* 10*d.* per ton; againft this is to be placed fafety, time gained in paffing from coaft to coaft; and the difference in infurance, that ufually in time of war being in coafting it from 15*l.* to 20*l*; and by the canal, 5*l.* Phillips's General Hiftory of Inland Navigation, and Sinclair's General Statiftical Account of Scotland.

FORTIFICATION, called alfo *Military Architecture*, is the art of fortifying or ftrengthening a place, by making works around the fame, to render it capable of being defended

fended by a ſmall force, againſt the attacks of a more numerous enemy.

Some authors go back to the beginning of the world for the author and origin of military architecture. According to them, God himſelf was the firſt engineer; and paradiſe, or the garden of Eden, was the firſt fortreſs. Cain improved on the hint, in building the firſt city, Gen. iv. 17. After him came Nimrod, Gen. x. 10. Then Semiramis, as Poliænus relates, Stratagem. lib. viii. cap. 27. The Canaanites, Numb. xiii. 19. Deut. i. 28. David, 2 Sam. v. Solomon, 2 Chron. viii. 4. Rehoboam his ſon, 2 Chron. xi. 5. and the other kings of Judah and Iſrael; and at length the Greeks and Romans. Vitruvius, lib. x. cap. ult. and lib. i. cap. 5.

Such is the ſeries of thoſe who fortified places; to which might be added Pharaoh, the perſecutor of the Iſraelites, who built the cities of Pithom and Raamſes, Exod. i. 11.

In thoſe remote times, when the property of individuals was leſs valuable, or owing to the little progreſs made by mankind in the arts of deſpoliation, the only fences in uſe were ſuch as ſufficed to prevent the depredations of wild beaſts, and to prevent cattle from ſtraying among the few ſcattered patches of cultivation, or into thoſe immenſe wilderneſſes then unſubdued by the labour of man. At length the pleaſures of ſociety, added to the occaſional neceſſity for bartering with, or ſeeking the aid of neighbours, led mankind into cloſer compact, and ultimately to approximate ſo near as their ſeveral tempers or views might allow; and thus in time little hamlets and villages chequered the more open ſcites; theſe, again, accumulated ſo as to contain much property, and to excite among the more lawleſs a deſire to bereave them of whatever cattle, grain, &c. they might by their induſtry and frugality have amaſſed.

Hence aroſe that imperious neceſſity, which unfortunately for mankind has, notwithſtanding our boaſted civilization, been far from decreaſing. In times of yore, the conteſt was only between rival towns, and the fate of both was ſoon decided. Now we fight for kingdoms, while an inveterate hatred and jealouſy are handed down from one generation to another, like an heir-loom, founded on ſome paltry contention, or on ſome abſurd claim, in which the people at large are neither benefited nor even conſulted.

The means of defence naturally grew as the means of attack became more powerful; which, of courſe, they could not fail to do, in conſequence of the increaſe of faction, and of the intereſt taken by numbers in the cauſe of ſome plauſible pretender, or of ſome ambitious and daring adventurer. But it was not to be expected that the means of reſiſtance would be extended beyond what might be neceſſary to oppoſe the means of attack; therefore thoſe primary engines, the catapulta, the battering-ram, &c. were oppoſed by heavy maſſes of ſtone. The engineer confined himſelf to very ſmall projections, which, if we are correctly informed, in the firſt inſtance impended over certain parts of the wall, at various diſtances, like modern balcony-windows; theſe were gradually augmented both in area and in depth, until they became what are now called *round-baſtions*.

It does not appear that any important change took place for many centuries, nor, indeed, until ſome time after the invention of gun-powder, when battering cannon formed a part of the aſſailants' means, and ſpeedily evinced how little reliance could be placed on thoſe walls, which had formerly defied the powers of the ſeveral engines then in uſe; nor was it until iron ſhots were ſubſtituted for thoſe of ſtone, that the efficiency of artillery was properly underſtood. That being eſtabliſhed, the whole ſyſtem of defence was neceſſarily made to conform to the counteracting of thoſe deſtructive engines which now were introduced as the ordinary means of attack. The ſword and buckler, the lance, dart, javelin, ſling, bow and arrow, &c. loſt their reputation, and, dwindling into inſignificance on the great ſcale, were reſerved for individual conteſt, or for the minor purpoſes of deſultory warfare. It now became indiſpenſable, that the circumvallations ſhould be ſtrengthened, and to conſtruct ſuch ſtupendous bulwarks as might not only oppoſe the newly deviſed miſſiles, but, at the ſame time, ſupport ſimilar means of deſtroying the invading army and its batteries. By the exterior addition of deep ditches, and various outworks, great difficulty and delay were oppoſed to the beſiegers; while flanks, cavaliers, and eſpecially mines, were added for the more effectual accompliſhment of their deſtruction.

The great outline was thus marked out, but it remained for the moderns to bring the ſyſtem to perfection; for we find, that although the fortifications of the fifteenth century diſplay obvious improvements upon the ancient conſtruction, the grand principles were little underſtood, and that the minutiæ of this now important ſcience remained, until within a very few years paſt, moſt wretchedly defective. Men of genius, profiting by that experience which upheld the errors of engineers then conſidered ſkilful, at length remedied in part the defects of the old ſchool, and led the way to that exactneſs of proportion, and to that ſyſtematic arrangement, which characterize the works of our time.

We are not to conclude that this ſcience is confined merely to drawing out ſuch defences as ſhould ſuffice to prevent, or at leaſt ſo to retard the neceſſity for a ſurrender, as to coerce the beſiegers to evacuate their trenches; the immenſe armies now conſtantly brought into the field, and the heavy trains of artillery by which they are ever attended, occaſion not only an adequate preparation for reſiſtance, but the neceſſity for eſtabliſhing lines of communication of depots, &c. all of which muſt be on the beſt conſtruction for defence, containing ſafe lodgment for a ſufficient garriſon, together with ample and ſecure magazines for ſtores and proviſions. Conſequently, the engineers muſt poſſeſs great readineſs of computation, of diſcernment, and of appropriate reſource and application.

Without all theſe qualities the moſt ſcientific officer may fall into diſrepute; for, however valuable a perfect acquaintance with the theory may appear, yet the merely planning in the cloſet, and the laying down on a large plain ſuch lines of defence as may appear, in ſuch a ſituation, totally incapable of defeat, ſo far as may relate to mutual ſupport, and the great work of procraſtination, will be of no avail, if the other eſſentials which depend wholly on judgment and experience be wanting; the whole may be rendered abortive, and become contemptible, merely from a want of appropriateneſs in point of locality.

The period, in which the modern practice of military architecture may be ſuppoſed to have taken its riſe, was that in which the old circular towers were firſt converted into baſtions, about the year 1500. See Bastions.

The firſt authors who have written of fortification, conſidered as a particular formed art, are Latreille, Alghiſi, Marchi, Paſino, Ramelli, Cataneo, and Speckle, who, as Mr. Robins ſays, was one of the greateſt geniuſes that has applied to this art. He was architect of the city of Straſburgh, and died in the year 1589. He publiſhed a treatiſe of fortification in German, which was reprinted at Leipſic in 1736. Robins's Math. Tracts, vol. i. preface, p. 9.

After them Errard, engineer to Henry the Great of

France;

France; Stevinus, engineer to the prince of Orange; Marolois, the chevalier de Ville, Lorini, Coehorn, the count de Pagan, and the marſhal de Vauban: which laſt two noble authors have contributed greatly to the perfection of the art. To whom we may add Scheiter, Mallet, Belidor, Blondel, Muller, &c.

Under the head of Construction, *Military*, we have entered at length on the ſeveral proportions of fortifications conſidered in its ſeveral claſſifications, and have ſhewn the ſeveral component parts, as formed and ſituated according to the ſyſtems adopted by the moſt celebrated engineers; therefore we abſtain from giving, in this place, any detail of their ſeveral principles; confining ourſelves to whatever may appertain to the ſcience in a general point of view.

Fortification, *the art of*, may be diſtinguiſhed into two parts, *viz.* the *elementary*, or *theoretical*, and *practical*.

Elementary, or *theoretical*, fortification conſiſts in tracing the plans and profiles of a fortification on paper, with ſcales and compaſſes; and in examining the ſyſtems propoſed by different authors, in order to diſcover their advantages and diſadvantages: whereas *practical* fortification conſiſts in forming a project of a fortification, according to the nature of the ground, and other neceſſary circumſtances, tracing it on the ground, and executing the project, together with all the military buildings, ſuch as magazines, ſtorehouſes, bridges, &c.

Fortification again is either *offenſive* or *defenſive*. *Offenſive* fortification is the ſame with the attack of a place, and is the art of making and conducting all the different works in a ſiege, in order to gain poſſeſſion of the place. See Attack and Siege.

Fortification, *defenſive*, or *Defence*, is the art of defending a town that is beſieged, with all the advantages which the fortification of it will admit. See Defence.

Fortification is generally divided into two diſtinct branches, *viz.* natural and artificial; and again into regular and irregular. In natural fortification but little is required of the engineer; the defences offered by ſituations nearly inacceſſible rendering the aid of art ſometimes ſuperfluous, or nearly ſo; therefore, in ſuch inſtances but few additions are needful, and thoſe chiefly with the intention of preventing a *coup de main*. For want of ſuch a precaution, many important poſts have been ſuddenly and eaſily taken, which no army, however numerous and well provided, could have forced, unleſs indeed by ſtarvation, into capitulation. It would be impoſſible to afford any inſtruction regarding the works neceſſary in this branch of defence, ſince every thing muſt depend on local circumſtances, in the proper adaptation of which the engineer has the moſt favourable ſcope for a diſplay of talent.

This applies equally to offenſive and to defenſive conſtruction; the former applying chiefly to the various works uſed in attacks and ſieges, and the latter to the more general purpoſes of defending towns, forming depots, commanding, or poſſeſſing particular ſituations, ſcouring thoſe parts which admit of approach, protecting or covering harbours, &c. and, in general, more tending to ſelf-preſervation, and to controul, than aiming to annoy others, or to the acquiſition of dominion. When works are built in a ſolid manner, ſuch as ſhould laſt for many years, they are called permanent: of this claſs are all citadels, fortreſſes, commanding redoubts, and block-houſes, &c. When raiſed only for any particular purpoſe, after the completion of which they are either deſtroyed or abandoned, they are ſaid to be temporary: of this kind are all entrenchments made for covering of the flanks, &c. of armies while in the field; the trenches opened by beſiegers, with all their ſupporting or cautionary lines; batteries made on emergency; together with all, under whatever term they may be denominated, which have only a periodical utility.

With reſpect to whatever relates to regular fortifications, we have already, under Construction, *Military*, diſplayed not only the ſyſtems moſt generally approved, but their good and bad qualities, for the expoſition of which, we are indebted to gentlemen whoſe profeſſional ſkill is too pre-eminent to be dependent on our applauſe. There the principles laid down by that great maſter of the ſcience, Errard, together with the ſeveral variations adopted by Vauban, Blondel, count Pagan, Bombelle, the Chevalier de Ville, Sardi, Coehorn, Belidor; the marquis de Montalembert, &c. &c. may all be ſeen both abſtractedly, and contraſted in the moſt perſpicuous manner. In the ſame place we have furniſhed a complete detail of the ſeveral features of regular fortification, and explained their ſeveral intentions. It is here proper to remark, that fortifications can be conſidered regular only when the encloſed area is of ſuch a form, whether a triangle, a ſquare, a circle, an ellipſis, as may be inſcribed in a regular manner according to geometrical operations.

It is uſual, indeed indiſpenſable, to divide the great ſurrounding line, or circumference, into as many faces, or portions, as may be beſt adapted to the conſtruction of ſuitable defences according to one or other of the three ſyſtems; namely, great, mean, and little. The number and extent of theſe faces muſt be regulated as well by the extent, as by the form of the area to be incloſed. Small circles may be divided into five or ſix faces; moderately extenſive ovals may have ſix alſo; while both circles and ovals of greater range will demand one or more additional faces; in order to reduce the exterior lines of defence within ſuch bounds as may duly proportion the faces and flanks in every part, and keep the angles within juſt limits.

Whatever may be the arrangement, it muſt ever be attended to, as a fundamental axiom, that every part may be defended by ſome other ſtanding within the ordinary point-blank range of a muſket. Whenever this point is overlooked, the defences will be proportionably weakened, according to the undue prolongation of the faces, the abſence of protecting flanks, and the conſequent deficiency of mutual ſupport.

Taken in the aggregate, a fortification ſhould not be deemed "irregular," merely becauſe the ſeveral faces may be in ſome degree diſſimilar, provided each face be in itſelf regular, and that the junctions of the ſeveral faces of the connecting baſtions be ſeverally effected in a regular manner. But this can reſult only from a great attention to conſtruction, and can never take place where the figures or their proportions are heterogeneous; ſuch as half a ſquare, and half a pentagon: whereas the half of a ſquare may be united with the half of a hexagon, or any figure whoſe multiple is 2. So may half a pentagon be united with half an enneagon, (or figure of nine ſides) though they have no common multiple, becauſe in each there would be half a baſtion, and half a curtain for their reſpective terminations, which could of courſe be eaſily blended.

Let us ſuppoſe that the circumference of an area be elliptic; the two more circular parts, namely, thoſe ſtanding at the extremities of the conjugate diameter, may be fortified according to that ſyſtem their radius may ſuggeſt, ſay according to the mean ſyſtem, while the two long ſides, being each ſegments of larger circles, will probably require to be divided each into two faces, all of which will be moſt appropriate to the great ſyſtem. One end may have a horn-work, the other a crown-work, and the ſeveral faces of the

two

two long ſides may have each a raveline, with, or without lunettes, tenaillons, counter-guards, bonnets, fleches, &c. yet the whole may bear ſufficient types of regularity to allow its coming under that deſignation; the rules neceſſary for the due combination of a regular and perfect ſyſtem of defence, as founded on approved ſyſtems, being, in every inſtance, obſerved.

The figure, and the number of faces into which it is to be portioned off, being determined upon, it then becomes a queſtion whether the works are to be planned *outwards* or *inwards*. In the former caſe, the figure becomes the interior lines, and a great addition is made to the area, but the works will be far more extenſive, and require a more numerous garriſon than when the place is to be fortified *inwards*, whereby all the works are thrown within the figure, to the great diminution of the area, and conſequent reduction of the works, which may then be defended by about one-third the number of men required in the other mode.

The proper *defilement* of the ſeveral works, as relating to the body of the place, muſt ever be attended to. By this term we comprehend the ſpread, or arrangement, of the outworks in that ſubordinate manner progreſſively, whereby thoſe moſt remote are invariably under the command of thoſe nearer, from the main defences included in that line called the principal, which uſually conſiſts of alternate curtains and baſtions. Every outwork muſt defend, or prevent the approach to, ſome particular point; or it muſt occupy ſome ſpot which might alſo give advantage to the enemy. Whatever be its ſituation or intention, it ſhould be ſo conſtructed as never to ſerve as a ſecure lodgment when taken by the enemy, nor ſhould its face or its flanks preſent the means of attacking others of the defences. This precaution can be properly effected only by keeping the ramparts ſo low as to be commanded from every part of the interior, and by cauſing the flanks to be expoſed to ſome powerful flanking fire, whereby the enemy would be too ſeverely galled to admit of his retaining poſſeſſion. Further, the aſpect of every ſuch outwork ſhould be carefully averted from the poſſibility of making even a grazing fire upon other defences; to inſure which, the angle made therewith ought not to be leſs than 120 degrees, for proximate, and 150 degrees for more remote batteries.

In moſt fortifications, the garriſon and the ſtores, but eſpecially the ammunition, are lodged in ſecurely vaulted buildings, which, from their power to reſiſt the fall even of the largeſt ſhells, are deſignated "bomb proofs," that is, proof againſt bombs; many of the more retired parts of the body of the place, ſuch as the curtains, are vaulted in a ſuitable manner for the accommodation of the troops, and magazines for powder are built in various parts, ſo as to be ſufficiently near to the ſeveral works they are to ſupply. For the deſcription of *magazines*, we refer to that article.

The ramparts have rarely ſufficient *talus*, or ſlope, within, to admit of men aſcending directly from the terre plein of the interior; though in ſome looſe ſoil the angle is ſo great as to offer conſiderable facility in that reſpect; but it being neceſſary to provide means for the paſſage of heavy ordnance up and down, as well as to favour the eaſy and ready acceſs of troops to every part of the defences, long ſlopes, called "ramps," are made in various parts, but eſpecially within the ſeveral ſaliant angles; theſe ſhould be from eight to twelve feet wide, according to their ſituation and importance, and ought to be very firmly ſupported at their ſides, eſpecially if not made to lie along the inſide of the rampart. The aſcent, or elevation of a ramp, ſhould never exceed thirty degrees; but, where practicable, they are better under, than over, twenty degrees.

In every fortified place great attention ſhould be paid to the ready acceſs of troops from every quarter towards each ramp. This can be effected only by a proper diſtribution of the ſeveral ſtreets and avenues, and by keeping full thirty yards or more clear all around the interior. The houſes neareſt to the ſeveral works ſhould be allotted to the garriſon, or to ſuch volunteers, &c. as might be able, in caſe of a ſurprize, to man the works inſtantly; while thoſe parts neareſt to the magazines and principal defences ſhould be occupied by perſons appertaining to the artillery. Should an enemy even ſucceed in a *coup de main*, ſo far as to aſcend to the body of the place, they might, by ſuch an allotment, be driven from the ramparts; or if they ſhould deſcend into the interior, might be oppoſed by a formidable force collected from the houſes, overlooking the body of the works.

To favour the ſorties made by the garriſon for the purpoſe of ſtorming the trenches of the beſiegers, and of demoliſhing their batteries, magazines, &c. ſally-ports are made in various parts, generally concealed from the knowledge of all but a few, and carefully cloſed until ſuch time as a ſortie is about to take place. Counter-mines are made under the ſeveral defences, with the view to prevent the enemy from carrying their galleries under them; and mines, as well as ſmaller *fougaſſes*, are ſunk with the intention of blowing up ſuch outworks as, when poſſeſſed by the enemy, might prove obnoxious to the defendants.

In every fortified place, a ſufficient ſupply of good water is indiſpenſable. If conduits proceed from a river, lake, &c. they muſt be ſecured from the enemy's ſhot, and, where neceſſary, be amply defended by ſuitable works. Large ponds ſhould be made in every fortreſs where ſpace can be allowed, and in every outwork one or more wells of proper diameter, and ſecurely framed, or lined with maſonry ſhould be ſunk. In fact, the utmoſt attention ſhould be paid to the furniſhing every quarter abundantly, and to preſerving ſuch as may be carried off the tops of houſes &c., during falls of rain, by means of pipes leading to ciſterns concealed under ground.

Hiſtory furniſhes various moſt encouraging inſtances of the good effects reſulting from the fortitude of garriſons, weak in numbers, and even indifferently ſupplied. We need look no farther back than to the glorious defence made by the unfortunate city of Saragoſſa; and to the wonderful obſtinacy with which the brave inhabitants, both male and female, of Gerona, contended againſt a very ſuperior and highly diſciplined army. The chances of war are greatly in favour of any garriſon under fair circumſtances; if it be ſtrong and well appointed, it may make ſo many ſorties, as to harraſs the beſiegers greatly; and eventually may be ſo ſucceſsful as to cut off large portions from time to time; ſo that when added to thoſe diſeaſes ever attendant upon fixed camps, the enemy may be unable to continue the ſiege. Few ſituations admit of a blockade, which can rarely be attempted by any army not very far ſurpaſſing the garriſon in numbers; therefore occaſional ſupplies and reinforcements may be generally expected. Conſidering alſo the immenſe loſſes to which the aſſailants are ſubject when their approaches are puſhed near to the body of the place, and the uncertainty attendant upon the attempt to force a paſſage through any breach that may be made, it ſhould appear that much remains in the power of an orderly and brave garriſon, even after ſuch advantages may have been gained by the beſiegers, as ſhould lead to the opinion of their being ſoon in poſſeſſion of the place. What with cutting off diſmantled works, filling the breach with burning faggots, cotton ſteeped in oil, &c. mining, traverſes, ſhowers of grenades, and of grape-ſhot, it is evident that the aſſailants may have to overcome the moſt formidable obſtacles, and after-

after all be obliged to allow the garrifon, to retreat by fome oppofite outlet, leaving them in poffeffion of a ruined fortrefs! If the retreat be made to a good citadel, the advantage gained may be purely nominal; and the befiegers may be happy to relinquifh thofe defences, to gain which fo much time, treafure, and blood were expended.

Field-fortification is generally of a temporary nature, and abounds with variety; no two fituations being exactly fimilar. Here the engineer has a noble opportunity for the difplay of fkill. It often happens that a fmall, or inferior army is compelled to choofe, and that too without much delay, fome ground affording natural advantages, whereon to entrench and to make a ftand. No time is left for deep refearch, for confultation, for fubftitution, or for the correction of errors. In fuch cafe the weak points muft be firft attended to, and fecured fo far as circumftances may permit; after which the ftronger pofitions muft be amply fortified, and rendered both compact in themfelves, and aids to the weaker pofts. By thefe means a very powerful line of defence may be eftablifhed, care being taken to place the artillery in thofe places moft conducive to their full effect, and in particular guarding the moft acceffible parts in fuch manner as fhould deter the enemy from approaching. In fome inftances it is expedient to allure towards fome point apparently weak, and, when it is attacked, to open various mafked batteries fuddenly on the flanks of the affailants. This never fails to difcourage, and at all events creates much doubt, while it eftablifhes the reputation of the defenders, and caufes them to be treated with much diffidence and refpect.

The following practical maxims, regarding the conftruction of field works, may prove acceptable.

1. The fpot on which the works are to be conftructed fhould determine their figure; no facrifice of ftrength fhould be made in order to preferve any regular form, that difpofition being the beft which occupies the ground to the greateft advantage.

2. All flopes, and approaches of every defcription, fhould be fubjected to the direct fire of the defenders; obferving that the fmall arms being in fuch cafes of material fervice, the feveral flanking parts fhould never exceed the diftance of two hundred yards, but that, if poffible, the whole of the furrounding country, for five hundred yards at leaft, fhould be difcoverable, and open to the fire from the works.

3. Works that are intended for the defence of a defile, fhould always be within mufket fhot (*i.e.* 200 yards), fo that if taken by the enemy, they may to him be equally untenable.

4. In flanking-defences, thofe which ftand at right angles are preferable, becaufe the fire from one face is always parallel to the other face, and muft, of courfe, take the affailants in flank by a direct fire thereon: a matter known to be of fingular importance, efpecially where new levies man the works; it being extremely difficult to enforce a proper attention to taking a cool and deliberate aim.

5. If a faliant-angle is lefs than 60 degrees, it will expofe its faces to be enfiladed by an enemy fituated nearly in the line of its capital, and it will befides be weak in many refpects; befides preventing the other defences from projecting in a proper manner, left they fhould become fubject to its operations, if the raveline, redan, &c. it compofes, fhould fall into the hands of the enemy.

6. On the other hand, re-entering angles fhould never be greater than 120 degrees; becaufe that is the utmoft fcope that can poffibly be allowed for the direction of even mufketry, when ferving as a flanking-fire. Cannon can rarely graze upon the adjacent battery or flank, when the re-entering angle exceeds 105 degrees; the declination of the embrafures not allowing more than from 10 to 12 degrees of lateral inclination.

7. Always make the entrance to a redoubt, or other work of that nature, fomewhere in its rear, or in whatever part may be leaft expofed; taking efpecial care fo to cover the entrance by traverfes, either plain, curved, or angular, fuch as may expofe the enemy, fhould he attempt to force an entrance, to a galling fire, as well as to fhowers of grenades, ftones, or any other mode of annoyance. Where practicable, every entrance fhould have a draw-bridge, or at leaft a *chevaux de frize*; or, for want of them, an *abbatis* made of trees, of which the branches have been lopped to points outwardly arranged, may prove an excellent defence.

8. Where the entrance muft be made fomewhere in the front, it fhould be in fome re-entering angle, and always in a curved or angular direction, fo as to prevent cannon-fhots from fcouring the path-way. This may alfo be prevented by throwing feveral traverfes acrofs; caufing all who enter to pafs round their ends by means of indentations in the lateral wall, or palifades: but this latter mode is ill fuited to the paffage of guns, and is moft applicable to *caponnieres* leading from bonnets, fleches, and other fuch out-works that are chiefly intended as pofts for mufketry only, and which may be manned only on particular occafions.

9. All troops or batteries acting within narrow limits, which gradually extend in front, are fubject to the inconvenience of prefenting a lefs front than the enemy can fhew in oppofition thereto. It therefore requires much caution and judgment, when taking poft, with a view to felf-defence, not to become expofed to fuch difproportionate powers. It is fometimes better to retreat altogether into a pafs, fortifying the entrance internally, than to cover it exteriorly. Every thing muft depend on circumftances; but there fhould be no means omitted to prevent the enemy from coming round on the flanks, as they will affuredly do, if localities may permit.

10. A pofition commanded, efpecially by mufketry, from any eminence in front, flank, or rear, muft, generally fpeaking, prove untenable. Where the opening for fuch command is very confined, it may perhaps be cut off by epaulements, raifed to a fuitable height, fo far as to obftruct any plonging fire; but the *ricoçhet* fire can only be prevented by fuch a number of traverfes as may effectually cover the interior. Hence nothing fhort of peremptory neceffity fhould induce to taking up fuch a pofition. Obferve, that of all fires, that upon a flank, which is called "enfilading," is the moft deftructive.

11. No reliance can be placed on a poft, of which the rear is fubject to attack. If, notwithftanding every precaution, this liability may exift, the beft chance is to keep a good look out; and in cafe the enemy fhould attempt an attack in that quarter, to abandon the poft, and either to charge him in front while his force is divided, or to allow his penetrating far enough in the rear to be attacked with effect, either by the whole, or by fuch a detachment of the garrifon as circumftances may dictate. It is fcarcely ever practicable to fortify againft both front and rear, without dividing the defenders in fuch manner as muft weaken, and fubject the party to deftruction. A redoubt well conftructed, or a well chofen fpot, open on all fides, will, in fuch cafe, be preferable to any lines badly covered in their rear.

12. In drawing out lines of defence, &c. make the faces directly towards thofe parts moft fubject to attack; keeping the angles (efpecially the faliant) out of thofe directions that may fubject them either to affault, or to be enfiladed.

13. Knowing

13. Knowing the ſtrength of your force, take care to proportion your defences accordingly: give from ſix to eight paces, or ſay twenty feet at the moſt, for every piece of ordnance; and for every firelock allow two feet. If there ſhould be no cannon to provide for, one foot only ought to be allowed for each firelock; obſerving that the infantry are always ſuppoſed to be drawn up two deep: thoſe on the *banquette* never to fire until thoſe on the *terre plein* may have loaded, except on emergency.

14. In the above computation, always caſt out a ſixth part of your force, both artillery and muſketry, to be in reſerve: the former to replace any that may be damaged; the latter to aid wherever the garriſon may be hard preſſed, as well as to fill up vacancies.

15. The interior of a work ſhould never be ſo crowded as to debar the garriſon from moving freely, and eſpecially from lying down. It is uſual to compute that each piece of artillery, with its appurtenances, and the men employed to work it, will occupy about 220 ſquare feet. This relates to field pieces; but heavy ordnance will demand full half as much more. For every muſket a ſpace of 18 feet ſhould be allowed; but in this much muſt depend on climate. Where extreme heats are prevalent, double that area will be indiſpenſable; while, in very cold ſituations, much leſs may ſuffice. Interior ſpace is, however, always deſirable, provided the defences be not thereby ſo extended as to render the garriſon unequal to their maintenance.

16. The ſubſtance of parapets for field-works muſt depend both on the weight of metal oppoſed to, and mounted on, them; the ſoil will alſo occaſion much variety; but, if moderately firm, it ſhould be at leaſt 12 feet in thickneſs; but 15 will, in moſt caſes, be better. Thoſe intended to reſiſt muſketry only need ſeldom exceed 8 feet: in many caſes, eſpecially where ſound clay can be obtained, leſs may ſuffice. The height muſt conform to local circumſtances; obſerving that the *banquette* ſhould always be raiſed to $4\frac{1}{2}$ of the creſt, otherwiſe men of ordinary height could not level over in a proper manner.

17. Works made on the borders of ravines muſt be ſo conſtructed as to have full command down to the bottom of every part, and eſpecially of all deſcents to them from the oppoſite ſide. Such may be very eaſily covered; but where that advantage does not exiſt, the ditch muſt be made as wide and as deep as may ſuffice at leaſt to ſupply ſoil for the ramparts and parapets. No batteries can be better than thoſe excavated from maſſes of rock, or obdurate tough ſoil, inacceſſible towards the front. But ſuch are rarely reſorted to in this branch of fortification. Mounds of earth may either be cut through for embraſures, ſo as to cover the cannon; or they may be ſcarped both within and without in ſuch manner as to prove admirable lines, mounting the cannon *en barbet*. If a wide range towards the flanks is requiſite, this latter mode is highly appropriate.

18. In the conſtruction of *tetes de pont*, always ſelect a re-entering angle, where ſuch can be found properly ſituated. This will prevent the enemy from commanding the flanks and rear; as he inevitably would, if the works were conſtructed upon a ſaliant angle of the ſtream. Beſides, in the former mode, the defenders may line the oppoſite banks, on both ſides of the bridge, with additional defences, that would act on the flanks of thoſe advancing to the attack, as well as when abſolutely croſſing upon the bridge, which might of courſe be deſtroyed by the fire of heavy artillery.

19. Four magazines ſhould be ſo divided along your works, as to afford a ready ſupply to every part; yet ſhould each be ſo far removed as to prevent material injury to the defences, in caſe of exploſion. If duly ſunk, and covered by epaulements, and by an adequate load of ſoil ſupported on faſcines, &c. reſting on good props, they will be in little danger even from the heavieſt ſhots thrown by cannon; but it will not be eaſy to give them ſtrength enough to reſiſt the fall of a heavy ſhell. The apertures of all magazines ſhould face towards that quarter leaſt expoſed to the enemy's fire.

For the minor parts of conſtruction, we refer our readers to the articles Fascine, Gabion, Battery, &c. where the ſeveral proportions and uſes of each will be found detailed. To conclude this ſubject, we ſhall briefly obſerve, that the ſame general principles, which govern in the conſtruction of *permanent* fortifications, apply, ſo far as circumſtances may admit, to the projection and to the raiſing of *field-works* in general. The mutual ſupport of contiguous parts muſt ever be the principal conſideration.

Fortification is alſo uſed for the place fortified: or the ſeveral works raiſed to defend and flank it, and keep off the enemy.

All fortifications conſiſt of lines and angles, which have various names, according to their various offices.

The principal angles are thoſe of the centre, the flanking angle, flanked angle, angle of the epaule, &c.

The principal lines are thoſe of *circumvallation*, of *contravallation*, of the capital, &c. See each in its place.

Fortifications are divided into *regular* and *irregular*, and again into *durable* and *temporary*. *Regular* fortification is that wherein the baſtions are all equal; or that which is built in a regular polygon, the ſides and angles whereof are generally about a muſket-ſhot from each other.

In a regular fortification, the parts being all equal, have the advantage of being equally defenſible; ſo that there are no weak places. *Irregular* fortification is that wherein the baſtions are unequal, and unlike; or the ſides and angles not all equal, and equidiſtant.

In an irregular fortification, the defence and ſtrength being unequal, there is a neceſſity for reducing the irregular figure, as near as may be, to a regular one; *i. e.* inſtead of inſcribing it in a circle, it ſhould be inſcribed in an oval, ſo that one half may be ſimilar and equal to the other half.

And as the irregularity of a figure depends on the quantity of angles and ſides; the irregularity of a fortification ariſes either from the angles being too ſmall, or the ſides being too long, or too ſhort.

Conſequently an irregular figure being propoſed to be fortified; all the angles, with the quantity of the ſides, muſt be found, to be able to judge how it is to be formed. See *Plate* V. *Fortification*, *fig.* 1. which repreſents a fortification inſcribed in an oval.

In this caſe the ſides C D, G H, on the flat parts, are ſtronger than the ſides A B, E F, on the narrow parts, ſuppoſing all the exterior ſides equal, and the place equally fortified. When the angles B C D, C D E, of the polygon are very great, and the beſieger comes within a ſmall diſtance of the works, he cannot approach nearer, without being ſeen in front, except by a direct ſap, with traverſes; and as this way of approaching preſents but a ſmall front, the beſieged, who have a much larger, may oppoſe with peculiar advantage: whereas, if the angles H A B, A B C, of the polygon, are very ſmall, the beſiegers carry their approaches to the counterſcarp itſelf, and have always a larger front than the beſieged; and, as the beſiegers muſt extend their approaches to three fronts, whether they are ſmall or large, the work of the approaches before the front B C D E will be to the work before the front H A B C, as the line B E is to the line H C, nearly, *i. e.* as the greateſt

axis

axis of the oval is to the leſs; and therefore the front C D, on the flat ſide, is ſtronger than the front A B, on the narrow ſide; conſequently, the longer C D is, ſo that the lines of defence are within the reach of muſket-ſhot, and the angles B C D, C D E, are the ſame, the ſtronger will the front be; ſince the works become more ſpacious, hold more troops to defend them, and the beſiegers are obliged to extend their trenches farther. Moreover, the greater the angles of the polygons B C D, C D E, are, the exterior ſides being the ſame, the ſtronger will be the front C D; becauſe the length of the line B E increaſes, and the extent of the beſiegers approaches in proportion; and, therefore, the ſtrength of a fortification increaſes in proportion to the number and length of its ſides; ſo that a dodecagon is ſtronger than an octagon, when the length of their ſides is the ſame. However, as it is found difficult to inſcribe a polygon in an ellipſe or oval, the following more eaſy method will anſwer the purpoſe. Reduce the ſpot of ground to be fortified to the figure A C E G (*fig.* 2.) and draw B E, A F, parallel to each other; draw C H, D G, perpendicular to theſe lines, and at equal diſtance from the points B and E, and let their interval be equal to that of the lines B E and A F: then draw D C, G H, parallel to A F and B E, and equally diſtant from them; and from their interſections C, D, G, H, with D G, C H, as centres, deſcribe arcs, with a radius equal to C D or G H, ſo as to interſect the lines A F, B E, in A, B, E, F; join the points A, B, E, F, and A B C D E F G H will be an oblong octagon, having one half ſimilar and equal to the other half. If a hexagon be to be deſcribed, inſtead of drawing the two lines C H, D G, one will be ſufficient; in a decagon there muſt be three, and four in a dodecagon. If the ſides cannot eaſily be made equal, then the ſides A B, E F, on the narroweſt part of the polygon, ſhould be the longeſt, becauſe it is the weakeſt. But when the figure cannot in any reſpect be made regular, the ſtrength of each ſide muſt be eſtimated according to the works a beſieger is obliged to make in the attack, and according to the obſtacles he meets with in his approaches. Muller's Elements of Fort. p. 146, &c.

Durable fortification is that built with deſign to remain a ſtanding ſhelter for ages. Such are the uſual fortifications of cities, frontier places, &c.

Temporary fortification is that erected on ſome emergent occaſion, and only for a little time.

Such are field-works, caſt up for the ſeizing and maintaining a poſt, or paſſage; thoſe about camps, &c. as circumvallations, contravallations, redoubts, trenches, batteries, &c. See each article.

Fortification, *Marine*, is ſometimes uſed by way of diſtinction from *land* fortification, and denotes the art of raiſing works fit for the defence of a harbour againſt the attacks of any kind of ſhipping; but the works proper for this purpoſe depend in a great meaſure on the principles employed in the fortification of towns. However, attention ſhould be given to the ſituation of roads or harbours in contriving works for their defence: *e. gr.* when a town lies open to the ſea, on a curved, or ſtraight bold ſhore, and has before it a ſufficient depth of water and good anchorage, the ſhips, in this ſituation, may be well defended by forts built near the water's edge on each ſide of the anchoring place, ſo contrived as to have two or three batteries, one higher than the other, and furniſhed with a ſufficient number of cannon, carrying ſhot from twenty-four to forty-eight pounds. A town, in this ſituation, may be defended by a rampart, or wall, well flanked, built along the ſhore, beſide the fortifications on the land ſide. The works along the ſhore ſhould be carried ſo near to the water's edge, that troops, attempting to land under the cannon of a fleet, might not find ground on which to intrench themſelves. Farther, when a harbour, being a bay, has a ſhoal or ſmall iſland lying before its entrance, a ſtrong fort ſhould be built upon the iſland, in a place where it can command the entrance on both ſides, if the iſland be not too large; otherwiſe two or more forts ſhould be erected in ſuch places as may command the avenues to the bay; other forts ſhould alſo be raiſed on the moſt convenient points of land, forming the mouth of the bay. Again, when the harbour is in a bay, whoſe points, forming the entrance, ſtretch into the ſea, and approach one another within cannon ſhot; ſuch a harbour may be fortified by building on both ſides of its entrance one or more forts; and, if poſſible, a fort ſhould alſo be built within the harbour's mouth in ſuch a manner, that its cannon can rake the ſhipping fore and aft as they come in.

When a harbour is formed by a cluſter of iſlands, it is eaſily fortified, if the channel between the iſlands is not too wide for the command of cannon from one or both ſhores; but if it be too wide, the ſhipping that rides there muſt be defended from the batteries on the ſhore. When the harbour lies in an inlet, or river, ſome miles above its mouth, a fort built at each point of the entrance, when the paſſage lies ſtraight, and can be commanded from ſide to ſide, and two others between them and the harbour, but not directly oppoſite, unleſs the breadth of the channel requires it, will be a proper ſecurity for the ſhipping in ſuch a harbour; and if the channel or river is winding, the forts ſhould be built where they can command a reach at leaſt, or be ſo placed at the bends, as to command two adjacent reaches. See Forts, and Robertſon's Treat. of Marine Fort. part ii. § 2. For the fortification of harbours by booms, ſee Boom.

Fortification, *Profile of a*, is a repreſentation of a vertical ſection of a work, ſerving to ſhew thoſe dimenſions which cannot be repreſented in plans, and are neceſſary in the building of a fortification. This profile is conſtructed in the following manner: provide a ſcale of equal parts, adapted to the perpendicular height of the work, *e. gr.* let *a b*, *Plate* V. *fig.* 3. be a ſcale of twenty toiſes; and let A B repreſent the level of the ground plane, ſo that thoſe parts of the fortification which are above the ſurface of the ground, or below it, may be above or below this line in the profile. From the point A, in the line A B, take A C = four toiſes three feet, for the interior talus or ſlope of the rampart; at C erect a perpendicular C D of three toiſes eighteen feet for the height of the rampart; through the point D draw an indefinite line D N parallel to A B, in which take D E = 5 toiſes for the breadth of the terre-plein of the rampart; at the point E erect the perpendicular E F = 2 feet from the height of the banquette, and draw F H parallel to D N, making F G and G H each equal to three feet. Draw the line E G, which will repreſent the talus of the banquette, and G H will be the upper part of it; on the point H erect the perpendicular H I = $4\frac{1}{2}$ feet from the height of the parapet above the banquette. From I, draw the indefinite line I K parallel to D N, in which take I L = $1\frac{1}{2}$ foot and draw H L which will be the interior ſide of the parapet: take L K = 3 toiſes for the thickneſs of the parapet, and from the point K let fall the indefinite line K P, perpendicular to the line A B, and produce it below A B: in this line take K M = $2\frac{1}{2}$ feet, and draw the line L M for the upper part of the parapet, which is a talus, that the ſoldier on the banquette may be able to diſcover the covert-way

way and the glacis. On the point N, where D N interfects K P, as a centre, with a radius of one foot, defcribe a fmall femi-circle, which reprefents the cordon; take N P = 6 toifes, and from the point P draw an indefinite line P n parallel to A B, which will reprefent the bottom of the ditch, the depth of which is fuppofed to be equal to the height of the rampart. Take N O = 5 feet for the thicknefs of the revetement of the cordon, and from the point O draw the indefinite line O Q parallel to N P; this will be the interior fide of the revetement of the point P, where the line P n meets the line N P; take P R = 7 feet, or about the fifth part of its height N P, for the talus of the revetement, and draw the line N R, which reprefents the fcarp or exterior fide of the revetement: take R S = 1 foot for the jutting of the foundation, and draw S T perpendicular to P n, making it equal to two or three toifes from the depth of the foundation; draw T Q parallel to P n, and let it interfect O Q in Q; and let Y & be drawn parallel to N M, and at the diftance of three feet for the revetement of the parapet. In order to reprefent the profile of the counterfort or buttrefs, when there is any, take O V = 9 feet, and draw V X parallel to O Q; V X, Q O, will reprefent this profile, by means of which the revetement O R is ftrengthened. That the terre-plein of the rampart may have a proper declivity for carrying away the water which falls upon it, let D W be equal to $1\frac{1}{2}$ foot, and draw W E, which will reprefent the upper part of the rampart, and the line A W reprefents the flope of its interior fide. Suppofe the breadth of the ditch to be twenty toifes, and lay this down from P to n; and on the point n erect the perpendicular n m, terminated by the line A B at m, which will be the limit of the conterfcarp. At the diftance of three feet from this line, and parallel to it, draw z y, which will give the thicknefs of the revetement of the counterfcarp; n u = 3 feet will be the talus of this revetement, and the line n m the exterior fide of it. The foundation may be made to terminate at the diftance of about fix inches from the point n. Let m c = 5 toifes be the breadth of the covert-way, and at the point c erect a perpendicular c d = 2 feet for the height of the banquette. Draw d f parallel to A B, and equal to one toife, in which take d e and e f each equal to three feet.

Draw the line c e for the talus of the banquette, and e f will be the upper part of it: from the point f erect a perpendicular f l = $4\frac{1}{2}$ feet, for the height of the parapet of the covert-way above the banquette. Produce f l till it cuts A B in r; take r g = 20 toifes from the breadth of the glacis, and draw l g, which will reprefent the glacis, or the declivity of the rampart of the covert-way: in this line take l h = 1 foot, and draw h f, which will be the interior fide of the parapet of the covert way; after which let there be a palifade conftructed on the banquette, and the profile is finifhed. Encyclop.

FORTIFIED Place, a *fortrefs*, or *fortification*, *i. e.* a place well flanked and fheltered with works. See *Plate* V. *Fortification*, *fig.* 4. with the explanation annexed to it, and *fig.* 5. which reprefents a fortified place befieged.

Places fortified after the modern way confift chiefly of baftions and curtains, and fometimes of demi-baftions, according to the fituation of the ground: of cavaliers, ramparts, fauffe-brayes, ditches, counterfcarps, covert-ways, half-moons, ravelines, horn-works, crown-works, out-works, efplanades, redents, and tenailles. See each under its proper article, Bastion, &c.

There are other moveable and additional parts; as bermes, parapets, banquettes, embrafures, cordons, boyaux, moulinets, chevaux de frife, chauffetrapes, galleries, mantelets, batteries, faps, mines, blinds, gabions, and palifades. See each in its place, Berme, Parapet, &c.

Several of thefe works, again, confift of diverfe parts, which have different denominations: thus, a baftion confifts of faces, flanks, cafemates, orillons, gorge, &c. which fee. See Fort, Fortress, Fortification, and *Military* Construction.

Fortified *Ifland*, in *Geography*, an ifland in the Indian fea, about a mile in circumference, ftony by nature, and fortified by art at a very great expence; the only landing-place being at the gate way, which is defended by ftrong works: about a mile from the coaft of Malabar, oppofite to Onore. N. lat. 14° 15'. E. long. 74° 4'.

FORTIGUERRA, Nicholas, in *Biography*, an Italian poet and churchman, was defcended from an ancient family, and born about the year 1674. Little is known of his early life, but he was advanced to a bifhopric by Clement XI. He feems to have fet his heart upon a cardinal's hat from Clement XII. It was, however, delayed fo long, that Fortiguerra fell into a lingering illnefs through chagrin and difappointment, which carried him off, in 1735, at the age of fixty-one. As an author, he is principally known by a burlefque poem, entitled "Ricciardetto," written in defence of the fuperiority of Taffo over Ariofto. The poem is in eafy verfe: the compofition was pleafant, but fanciful. It was firft publifhed in 1738 in 4to., and afterwards at Paris, in 3 vols. 12mo. He publifhed a tranflation in verfe of the comedies of Terence, printed in 1736, with the Latin text.

FORTIN or Fortlet, a diminutive of the word *fort*, importing a little fort, or fconce, called alfo field fort.

Fortin, *Star*, is that whofe fides flank each other, &c. See *Star* Fort.

FORTIORI. *A multo Fortiori.* See Multo.

FORTIS Aqua. See Aqua *Fortis*.

FORTISSIMO, Ital., in *Mufic;* the fuperlative degree of *forte*, implies very loud. The comparative degree of *forte* is *più forte*, more loud.

FORTITUDE, in *Moral Philofophy*, is one of thofe virtues which have been long diftinguifhed by the appellation of cardinal virtues; the other three being prudence, juftice, and temperance. To fortitude, indeed, the name of virtue has been particularly appropriated, not only by profane authors, but alfo in the facred writings. (See 2 Pet. i. 5.) Nor is this appellation mifapplied, if we confider that the mind muft be prepared by this virtue to acquire, and alfo to maintain the reft. True fortitude fhould be difcriminated from that mechanical courage, or natural intrepidity and daringnefs, which is often exhibited by thofe who have a great deal of fire in their conftitutions. Accordingly we may define it to be, fuch a firmnefs and refolution of fpirit, infpired by a fenfe of what is juft and honourable, as amidft all the dangers and evils incident to human life, enables a man fteadily to purfue the dictates of confcience and prudence. The *feat* of this virtue is the foul; whence it follows, that brawny limbs, a firm conftitution, and fermented blood, are not the qualities which conftitute a hero. The vigour of nature may be a good foundation for courage; but this is a quality of the mind, and confifts particularly in the refolution of the will, fupported by reafon and reflection. The *objects* of courage are the evils of life; and the office of fortitude is to qualify our fears of thofe evils, that they may never confound and aftonifh the mind;

mind; and when any of them arrive, to encounter and sustain them with an equal mind. Fortitude will also arm us with resolution to perform any action which duty demands, however difficult or hazardous; and to persevere in well doing, though with the prospect of various evils; and when any of these befal us, courage will so strengthen and support us, that we may not sink under them, or be tempted, through impatience, to forsake our duty. Courage, we may observe, does not exclude all fear, and therefore the declaration of Aristotle, Αφοβος ο Ανδρειος, the valiant is fearless, must be understood in a qualified sense. There are some things which ought to be feared; for as Aristotle observes (Ad Nicom. l. iii. c. 6.), "it is for a man's credit to fear infamy, and his disgrace not to be afraid of it." To which we may add, the displeasure of an almighty God. Not to fear infamy, as the moralist now cited observes, is a sign of impudence; and not to fear God is a sign of impiety. As there are some evils which ought to be feared, there are also some constitutions, in which it is impossible that fear should be wholly extinguished by fortitude; its office in this case is so to moderate and rule the passion of fear, that it may not deprive him of self-possession, and of the full use of his reason and liberty. In estimating the degree of fortitude, and its value in a moral view, allowance should be made for the difference of constitutions and of circumstances. The *rule* or *measure* of fortitude is a conscientious prudence; and consequently, if we consider it as a moral virtue, it then does not pertain to the soldier, who fights merely for pay or fame; to the man of honour, who gives or accepts the challenge; and much less to the self-murtherer. Fortitude, according to the definition given of it by Cicero (De Off. l. ii. c. 13.), is a superiority of mind both to pain and labour; and agreeably to this definition, we may distinguish fortitude into *active* and *passive*: the former denotes a virtuous ardour of mind, which carries a man on towards the glorious end he has in view, notwithstanding the labours, dangers, and difficulties that lie in the way; and this again may be divided into *civil* and *military*, to the former of which Cicero (De Off. l. i. c. 22.) gives the preference. To this we may apply the fine lines of Horace (l. iii. od. 3.)

"Justum, et tenacem propositi virum,
Non civium ardor prava jubentium,
Non vultus instantis tyranni
Mente quatit solida :———"

"The man resolv'd and steady to his trust,
Inflexible to ill, and obstinately just,
May the rude rabble's insolence despise,
Their senseless clamours, and tumultuous cries:
The tyrant's fierceness he beguiles,
And the stern brow, and the harsh voice defies,
And with superior greatness smiles."—Addison.

Passive fortitude imports a mind firm and erect under evils.

The extremes of this virtue are, on the one hand, rashness and insensibility, and, on the other, timidity and impatience. The virtues reducible to this head of courage, are magnanimity, equanimity, patience, meekness, constancy, and presence of mind.

Some writers have distinguished between fortitude and courage, representing the former as being always a virtue, and the latter as a virtue or vice, according to circumstances. Thus, a contempt or neglect of danger, without regard to consequences, may be called courage, which depends partly on habit, partly on strength of nerves, and partly on want of consideration; whereas fortitude is the virtue of a rational and reflecting mind, and is founded on a sense of honour and regard to duty. Fortitude, as it respects different sorts of evils, is variously denominated; with respect to danger in general, it is called intrepidity; in reference to the perils of war, valour; with respect to pain of body or distress of mind, patience; as it respects labour, activity; in reference to injury, forbearance; and to the general condition, magnanimity.

FORTORE, in *Geography*, a river of Naples, which runs into the Adriatic, two miles E. of Civita a Mare.

FORTRESS. Although it is common to call every defensible work a fortress, that designation cannot in strictness apply to any which are not fortified in such manner as may be perfectly independent, and capable of holding out, until, by means of a breach in some part of the main defences, an enemy may be authorized to force an entrance. With respect to a *coup de main*, every fortress is equally subject when insufficiently garrisoned, or destitute of provisions and of ammunition, or if proper precautions are not taken to prevent a surprize. According to the rules of defence, every fortress should be stored for six months, or at the least for four; when situate near to an enemy's territory, ammunition and provision, equal to full eight months consumption, ought to be laid in; so that the garrison might maintain itself until the return of that season, when the siege must, generally speaking, be raised. The importance of a position, for instance, such as Gibraltar, may demand, that stores of every description for two years be properly secured in bomb-proofs. With respect to the general principles of *fortification*, we must refer our readers to that head; as also to CONSTRUCTION, *Military*, under both which much useful information will be found.

FORTROSE, in *Geography*, situated on the north-side of the Murray frith, is a royal burgh, comprising two towns, *viz.* Rosemarkie and Chanonry, united under a charter granted by king James II. in the year 1444, and confirmed with greater immunities by James VI. in 1612. Rosemarkie was of high antiquity, having been erected into a royal burgh by Alexander II. Chanonry lies nearly a mile to the west, and is so denominated from having been at one period the residence of the bishop of Ross, but is now the seat of a presbytery. By virtue of its charters it was entitled to enjoy the same privileges and liberties as the town of Inverness; and, conjointly with the latter town, Nairn and Forres, sends one member to the British senate. It is described at that time as a place of consequence, where the arts and sciences flourished; and the seat of law, physic, and divinity, for this part of the kingdom. The town, at present small, comprising 278 houses, and 1289 inhabitants, still owes the little consequence it possesses to the recent establishment of an academy, under the direction of a rector and two masters, for the instruction of youth in classical learning and natural philosophy. Two parts of the ancient cathedral remain: one used as a place of sepulture for the family of Mackenzie; and the other as a sessions-house, the vaults below serving for a prison.

Dr. George Mackenzie, the author of the "Lives of the most eminent Writers of the Scots' Nation," was a native of this place.

Eight or nine miles N. W. of Fortrose, on the road to Dingwall, lies the barony of Ferrintosh, in the parish of Urquhart, which possessed, from 1690 to 1786, an exemption from the duties of excise on spirits distilled from grain of the growth of that district. N. lat. 57° 34'. W. long. 4° 5'.

FORTUNA EQUESTRIS. See EQUESTRIS.

FORTUNA, in our ancient *Law-Books*, is the same with what we call *treasure trove*.

"Thesaurum

"Thesaurum ducente fortuna invenire inquirendum est per 12 juratores pro rege, &c. quod fideliter presentabunt, &c. omnes fortunas, abjurationes, appella, &c."

Some pretend it also signifies *fortuito occisos;* but this seems to be very fanciful.

FORTUNATE ISLANDS, in *Ancient Geography*, an appellation which has given the critics and antiquaries great perplexity; being the name of a place famous for golden apples which grew there; or, as Varro says, for sheep with golden fleeces.

The ancients describe them as situate without the straits of Gibraltar, in the Atlantic ocean. The common opinion of the moderns takes them for the Canary islands; this is grounded principally on the situation and temperature of those islands, which render the use of cloaths there unnecessary; and from the abundance of oranges, lemons, grapes, and other delicious fruits growing there.

Ol. Rudbecks has found a very different place for them. That learned author, who makes his native country, Sweden, the scene of all that is great and extraordinary in ancient tradition and fable, will have the Fortunate islands to be Sweden, and the delicious fruits, talked of by the ancients, his imagination suggests were nothing but the virtue and good manners which anciently flourished in that cold hyperborean nation.

FORTUNE, Τυχη, is a name unknown in the earlier ages; and does not occur, as a divinity, either in Homer or Hesiod; as not being invented in their time.

In after-days it was introduced as a machine; and made to serve diverse purposes in natural philosophy and theology.

The most ancient circumstance we know concerning this goddess is, that Bupalus, a great statuary and architect, was the first who made a statue for her in the city of Smyrna; and that this ingenious artist thought fit to represent her with the polar star upon her head, holding in her left hand the horn of Amalthea, commonly called the Cornucopia. By the first of these symbols he is thought to have designed to express the power of this goddess over the world, and by the second that she was the dispenser of all goods. After him came Pindar, continues Pausanias, who celebrated this divinity in his verses, and gave her the name of Pharopolis, or the protectress of cities; such is nearly the origin of the worship of Fortune in Greece, a modern divinity not known before Pindar. In after-times the Greeks erected to her several temples. The inhabitants of Antioch, as well as those of Smyrna, held her in high veneration; and it is not improbable that several other people imitated their example. Among the encomiums given to this goddess by Pindar, he made her one of the Parcæ, and to have the greatest power of them all, whence we may conclude, that she was confounded with those inexorable goddesses, or, speaking more accurately, with Destiny itself, that blind divinity, who distributed good and evil at random: and such was the idea which the Greeks entertained concerning her.

The Romans conceived of her in a similar manner; since their most ancient Fortune being that which was worshipped at Antium, and which was confounded with the Lots, the use of which was so famous in that city, it is evident they did not distinguish her from Destiny, or that fate which the Geeks called *Eimarmene.* The Romans, content at first with consulting the Lots and Fortune at Antium, adopted at last this divinity, and established her worship in their city, where she had afterwards a great number of temples. The first was erected to her by Servius Tullius, and hence we deduce the date of the introduction of her worship into Rome. This edifice was consecrated to her under different names, under which various appellations she had appropriate temples, as we learn from Livy and Plutarch. A second temple was built by Ancus Martius to Fortune, under the title of *Fortuna virilis;* and she had likewise another under the name of *Female fortune;* and none but newly married persons were permitted to worship her. It is probable, that the Roman ladies were at the charge of building that edifice; accordingly it was reported, that at the finishing of it, the goddess had uttered these words, "Rectè me matronæ vidistis, ritéque dedicastis." Fulvius Flaccus raised the most magnificent temple of all to this goddess, under the appellation of the "Equestrian fortune." That which was erected to her by Q. Catulus was dedicated to the "Fortune of the day," *Fortunæ hujusce diei.* If that which Nero consecrated to her was not the most magnificent, it was the most singular and splendid, in regard to the materials of which it was formed. It was entirely of one sort of stone found in Cappadocia, called by Pliny *Phingias*, the marble of which, besides its remarkable hardness, was so white and glaring, that it is said, when the gates were shut one saw in it clearly. This temple was afterwards inclosed within that emperor's golden house. The same goddess had another in the new street under the title of "Fortune with breasts," who was represented much like Diana of Ephesus, and Isis, whose head-dress she wears upon some figures which are still preserved. Domitian built another temple to "Fortune of happy arrival," *Fortunæ reduci*, an expression which often occurs on medals, as well as that of *Fortuna redux.*

Plutarch, in an express treatise of the Fortune of the Romans, accounts for the practice of the ancient poets, who seem to make Jupiter the author of all the evils of life. Mankind, he observes, before the name of Fortune had got into the world, perceiving a certain arbitrary cause, disposing of things in an irresistible manner, called it *God:* but the same cause being often observed to act at random, and without any rule or order at all, the supreme being came to be divested of the attribute; and Fortune, or Destiny, acknowledged in his stead.

It is not easy to unravel what the ancients meant by the name Fortune. The Romans understood by it a principle of fortuity, whereby things came to pass, without being necessitated thereto; but what and whence that principle is, they do not seem to have ever precisely thought; whence their philosophers are often intimating, that men only framed the phantom Fortune, to hide their ignorance; and that they call Fortune whatever befals a man without his knowing for what purpose. Hence Juvenal, sat. x. ver. 366, affirms, they were men who made a deity of Fortune:

> "Nullum numen abest, si sit prudentia; sed te
> Nos facimus, Fortuna, deam cœloque locamus."

The ingenious Mr. Spence gives another reading of this passage:

> "Nullum numen habes, si sit prudentia; sed te
> Nos facimus, Fortuna, deam cœloque locamus."

This reading, he thinks, agrees best with the context: Juvenal says, ver. 356, that the two things we should pray for are good health and good sense; that we might be the authors of our own happiness if we pleased, ver. 363. that virtue is the only way to true happiness, ver. 364. that if we ourselves are prudent, Fortune has no power over us; and that in truth she is no goddess at all, and has only usurped a seat in heaven from the folly of mankind, ver. 366. Fortune was not considered as a deity by the old Romans, but was made so by the devotion and folly of the vulgar; and

Mr.

Mr. Spence fays, that he has feen an ancient gem, in which Cybele, the mother of the gods, is reprefented as turning away her head from Fortune, in an attitude of difowning and rejecting her. Polymetis, p. 150, 154, &c.

According to the opinion of the heathens, therefore, fortune, in reality, was only the arrival of things in a fudden and unexpected manner, without any apparent caufe or reafon; fo that the philofophical fenfe of the word coincides with what is vulgarly called *chance*.

But in religion it had a farther force; altars and temples in great numbers were confecrated to this fortune, as a deity. This intimates that the heathens had perfonified, and even deified, their chance; and conceived her as a fort of goddefs, who difpofed of the fate of men at her pleafure. Hence that invocation of Horace, "O diva, gratum quæ regis Antium," in the thirty-fifth ode of the firft book, where he recommends Auguftus, then preparing for a vifit to Britain, to her protection. From thefe different fentiments it may be inferred, that the ancients at one time took Fortune for a peremptory caufe, bent upon doing good to fome, and perfecuting others; and fometimes for a blind inconftant caufe, without any view or determination at all.

If then the word Fortune has no certain idea in the mouth of thofe who erected altars to her; much lefs can it be afcertained what it denotes in the minds of thofe who now ufe the word in their writings.

They who would fubftitute the name Providence in lieu of that of Fortune, cannot give any tolerable fenfe to half the phrafes wherein the word occurs.

Horace paints the goddefs, preceded by neceffity, holding nails and wedges in her hands, with a cramp-iron, and melted lead to faften it; rarely accompanied with Fidelity, unlefs when fhe abandons a family; for in that cafe Fidelity never fails to depart with her, as well as friends.

She is difrefpectfully fpoken of by moft of the Roman writers, and reprefented as blind, inconftant, unjuft, and delighting in mifchief. Ovid. ad Liv. ver. 52. ver. 374. Hor. lib. i. od. 34. ver. 26. lib. iii. od. 29. ver. 51. Statius, Theb. xii. ver. 505. However, they had a good as well as a bad Fortune, a conftant and inconftant Fortune, the latter of which was reprefented with wings, and a wheel by her. Hor. lib. iii. od. 29. ver. 56. We are wholly ignorant of the nature of that worfhip which the Romans paid to bad Fortune; but that they did pay homage to her is certain, fince, according to Cicero (De Nat. Deor. l. iii.), fhe had an altar on the Efquiline mount. As the inhabitants of Antium adored at the fame time two fortunes, called *Fortunæ geminæ*, the twin fortunes, it is probable that thefe were good and bad fortune. Martial, who alfo fays they were fifters, adds, that they iffued forth oracles upon the fea fhore. Suetonius calls the two fortunes "the Lots of Antium," becaufe it was by the Lots they were confulted.

Juvenal alludes to a ftatue of Fortune, which exhibited her under a very good character, as the patronefs of the poor infants that were expofed by their parents in the ftreets. Sat. vi. ver. 605.

The painters reprefent her in a woman's habit, with a bandage before her eyes, to fhew that fhe acts without difcernment; and ftanding on a wheel, to exprefs her inftability. The Romans, fays Lactantius, reprefented her with a cornucopia, and the helm of a fhip, to fhew that fhe diftributes riches, and directs the affairs of the world. In effect, it is with fuch characters, that we fee her reprefented on fo many medals, with the infcriptions, FORTVNA AVG. FORTVNA REDVX. FORTVNAE AVG. or REDVCIS, &c. Sometimes fhe is feen pointing at a globe before her feet, with a fceptre in one hand, and holding the cornucopia in the other.

The Romans, as he have already obferved, had a virile as well as a muliebrian Fortune for the objects of their adoration: the *Fortuna virilis* was honoured by the men, and the *Fortuna muliebris* by the women.

They honoured Fortune alfo under a variety of other appellations. The Fortune worfhipped at Antium was probably of the moft exalted character of any among the Romans, if we may judge by the account which Horace gives us of the great folemn proceffions that were made to her. Hor. lib. i. od. xxxv. ver. 22. But the moft celebrated temple of Fortune was at Præneste. Statius fpeaks of feveral Fortunes there, and calls them the *Prænestinæ forores*. Lib. i. Sylv. iii. ver. 80.

On the reverfe of a medal of Commodus, we have a reprefentation of Fortune, under the quality, or furname of *Manens*, *i. e. ftable, permanent;* holding a horfe by the reins. On the Greek medals we meet with ΑΓΑΘΗ or ΚΑΛΗ ΤΥΧΗ, *Good Fortune*. Conftantine gave the epithet *anthoufia*, *i. e. flourifhing*, to the Fortune of his new city Conftantinople.

FORTUNE, *Part of.* See PART.

FORTUNE *Bay*, in *Geography*, a bay on the S. coaft of Newfoundland; 20 miles N.W. of Placentia bay. This extenfive bay is interfperfed with fmall ifles, and within it are many bays, with great depth of water.

FORTUNE *Ifland*, or *Good Fortune Ifland*, a fmall ifland in the Indian fea, near the S.W. coaft of the ifland of Sumatra. S. lat. 1° 35′. E. long. 90° 25′.—Alfo, a fmall ifland in the Eaft-Indian fea, near the N. coaft of the ifland of Celebes. N. lat. 0° 50′. E. long. 123° 48′.

FORTUNE, *Iflands of*, two fmall iflands and rocks, near the W. coaft of Kerguelen's land. S. lat. 49° 21′. E. long. 68° 15′.

FORTUNE-*tellers*. Pretenders to tell fortunes, and to any crafty fcience for the difcovery of ftolen goods, are punifhable by imprifonment, pillory, and binding to their good behaviour, and fhall be deemed vagabonds. Stat. 9 Geo. II. cap. 5. fect. 4. Stat. 17 Geo. II. cap. 5. fect. 2. See CONJURATION.

FORTY DAYS. See QUADRAGESIMA, and LENT.

FORTY *days court*. See ATTACHMENT *of the foreft*.

FORTY *hours*, *prayers of*. See HOURS.

FORTY-*fhilling Land*, in *Agriculture*, is a term applied in Scotland to a certain portion of arable land. But the forty-fhilling land of old extent confifted of eight *oxgangs*, or one hundred and four acres.

FORULI, in *Ancient Geography*, a town of the Sabines, mentioned by Virgil. According to Strabo, it was feated on a rock, and very favourable in this refpect for the accommodation of thofe who might at any time engage in a revolt. Its precife fituation is not afcertained.

FORUM, in *Antiquity*, is ufed in divers acceptations; fometimes for a place of traffic, anfwering to our marketplace; in which fenfe it has ufually fome adjective added to it, as *forum boarium*, market for oxen and beef; *forum fuarium*, for fwine; *forum pifcarium*, for fifh; *forum piftorum*, for bread; *forum cupedinarum*, for dainties; and *olitorium forum*, the herb-market.

FORUM, again, is ufed for any place where the governor of a province convenes his people to give judgment, according to courfe of law.

Whence a man is faid *forum agere*, when he keeps the affizes; *forum indicere*, when he appoints the place where they are to be kept, &c.

FORUM was alfo a public ftanding place in the city of Rome,

Rome, where causes were judicially tried, and orations delivered to the people.

Of these *fora*, called *civilia*, in contradistinction to those of the first kind above-mentioned, which were denominated *venalia*, there were several; at first only three, *viz.* Romanum, Julianum, and Augustum; but that number was afterwards increased to six, by the addition of the Transitorium, called also Palladium; the Trojanum, and Salustii forum.

The first, and most eminent of these, was the forum Romanum, called also *forum vetus;* and absolutely, *forum*, or *the forum*. In the time of Romulus this was only a large open space without buildings or any other ornament. Tullus Hostilius first inclosed it; the elder Tarquin adorned it with porticos; and succeeding kings, consuls, and magistrates, rendered it at length one of the noblest places in the world. It was called "Forum Romanum," or simply "Forum," by way of eminence, on account of its antiquity in comparison of the other *fora*, and of its most general use in public affairs. Martial and Statius, for the same reason, give it the name of "Forum Latium;" Ovid the same, and of "Forum Magnum;" and Herodian calls it την αρχαιαν αγοραν, the old forum. The Comitium, used sometimes for holding the *comitia* (which see), was a part of this forum, in which stood the *rostra* (which see), a sort of pulpit, adorned with the beaks of ships taken in a sea-fight from the inhabitants of Antium. In this the causes were pleaded, the orations made, and the panegyrics spoken by persons at the death of their friends or relations. Near this was the "Puteal." Of this place critics have given different accounts; but the opinion of M. Dacier seems to be the most probable; who says, that the Romans, whenever the thunder fell upon a place without a roof, took care, from superstitious motives, to have a sort of cover built over it, which they called "Puteal." This had the name of "Puteal Libonus," and "Scribonium Puteal," because Scribonius Libo erected it by order of the senate. The prætor's tribunal, which stood very near it, is often denoted by the same expression.

The "Julian forum," called also "Cæsar's," was built by Julius Cæsar with the spoils taken in the Gallic war. Its area alone, as Suetonius informs us, cost one hundred thousand sesterces; and Dio affirms, that it much exceeded the Roman forum.

"Augustus's forum" was built by Augustus Cæsar, and was reckoned by Pliny among the wonders of the city. The most remarkable curiosity it presented was the statues in the two porticos on each side of the main building. In one were all the Latin kings, beginning with Æneas; in the other, all the kings of Rome, beginning with Romulus; most of the eminent persons in the commonwealth, and Augustus himself among the rest; with an inscription upon the pedestal of every statue, expressing the chief actions and exploits of the person it represented. This forum was restored by the emperor Adrian.

"Nerva's forum" was begun by Domitian, but finished and named by the emperor Nerva. In this forum Alexander Severus set up the statues of all the emperors that had been deified, in imitation of what Augustus had done in his forum. This forum was called "Transitorium," because it lay very convenient for a passage to the others; and "Palladium," from a statue of Minerva which was set up in it. Scarcely any thing remains of this forum, except an old decayed arch, which the people, by a strange corruption, instead of Nerva's arch, call Noah's ark.

"Trajan's forum" was built by the emperor Trajan with the produce of the spoils which he had taken in his wars. The porticos round this forum were exceedingly beautiful and magnificent, covered with brass, and supported by pillars of more than ordinary size, and exquisite workmanship.

The forum of Constantinople was erected by Constantine, when he established this city on the commanding eminence of the second hill, where he had pitched his tent, during the siege and conquest of Byzantium. This edifice was of a circular, or rather elliptical form: the two opposite entrances formed triumphal arches; the porticos, which inclosed it on every side, were filled with statues; and the centre of the forum was occupied by a lofty column, of which a mutilated fragment is now degraded by the appellation of the "burnt pillar." This column was erected on a pedestal of white marble, twenty feet high; and was composed of ten pieces of porphyry, each of which measured about 10 feet in height, and about 33 in circumference. On the summit of the pillar, above 120 feet from the ground, stood the colossal statue of Apollo, which was of bronze, and had been transported hither from Athens or from a town of Phrygia; and was supposed to be the work of Phidias. The artist had represented the god of day, or, as it was afterwards interpreted, the emperor Constantine himself, with a sceptre in his right hand, the globe of the world in his left, and a crown of rays glittering on his head. This statue was thrown down under the reign of Alexis Comnenus.

Forum is also used among Casuists, &c. for jurisdiction. Thus they say *in foro legis*, or the outer forum, *i.e.* in the eye of the laws, or the common course of justice; *in foro conscientiæ*, or the inner forum, *i. e.* in the eye of God, or man's own conscience.

There are a great many things not condemned *in foro legis*, which yet are criminal *in foro conscientiæ*.

Forum *Adriani*, in *Ancient Geography*, *Voorbourg*, a place in Insula Batavorum, S.E. of Lugdunum Batavorum; where Adrian established a kind of mart for the purpose of carrying on his negociations with Great Britain.——*Alieni*, a town of Gallia Cispadana, inhabited by the Lingones; now *Ferrara*.——*Appii*, a town of Italy, in Latium, on the Appian way, at the 43d mile-stone from Rome; built by Appius, who formed the way denominated from him. See Fossa *Nuova*.——*Aurelii*, a town of Italy, in Etruria, between Centumcellæ and Cosa; long since utterly destroyed.——*Ceramorum*, a considerable town of Asia, and the last of Mysia, 12 parasangs from Peltæ.——*Calvisii*, *Calvisano*, a town of Italy, in Gallia Cisalpina, in the canton of the Cenomanes.——*Cassii*, *S. Maria Forcassi*, a town of Italy, in Etruria, between Tarquinii to the west, and Falarii to the east.——*Claudii*, *Oriolo*, a maritime town of Italy, in Etruria, to the south-east of Carara.—Also, a town of Gaul, in the province of the Alps, the capital of the Centrones.——*Cornelii*, *Imola*, a town of Gallia Cispadana, W. of Ravenna, and S.E. of Bologna.——*Decii*, a town of Italy, in the country of the Sabines; supposed to be at or near *Furano*.——*Diuguntorum*, or *Jutuntorum*, *Crema*, a town of Insubria (Ptol.), in Gallia Transpadana, S. of Bergomum.——*Egurrorum*, a town of Spain, in the Tarragonnensis, seated on the Silus, in the country of the Asturi, W. of Asturica; supposed to be the present *Medina de Rio Seco*.——*Flaminii*, a town of Italy, S.W. of Nuceria.——*Fulvii*, a town of Italy, in Liguria, seated on the Padus, N.W. of Dertona; supposed to be Valence, in the duchy of Milan.——*Gallorum*, *Castel-Franco*, a small town of Gallia Cisalpina, S.E. of Mutina.—Also, a town of Spain, in the Tarragonnensis, and country of the Vascones, N.W. of Olca.——*Julii*, *Frejus*, a town situated on the coast of Gallia Narbonnensis, W. of the island of Lero. See Frejus.——*Lebuorum*, or *Libicorum*, a town of Italy, in

in Gallia Cifalpina; fuppofed to be *Borgo Lavizaro*, in the duchy of Milan.——*Lepidi, Regio*, a town of Italy, in Gallia Cifalpina.——*Licinii, Pieve d'Incino*, a town of Italy, in Gallia Tranfpadana, in the canton of the Orobii.——*Limicorum, Ponte de Lima*, a town of Spain, in the country of the Callaici Braccarii, fituated on the Limia——*Livii, Forli*, a town in the S.E. part of Gallia Cifpadana.——*Narbaforum*, a town of Spain, in the territory of the Callaici, towards the confines of Lufitania, S.E. of Aquæ Flaviæ.——*Neronis, Forcalquier*, a town of Gallia Narbonnenfis, N.E. of Catuiaca.——*Novum, Fornove*, a town of Gallia Cifpadana, towards the fouth, near the Tarus. —Alfo, a town of Italy, in the Samnium, N.E. of Beneventum, and at a fmall diftance from it. Its ruins appear near Paduli. —Alfo, a town of Italy, in the country of the Sabines; the fame, according to the abbé Chauppy, with *Forum Decii*.——*Popilii*, a town of Gallia Cifalpina, S.E. of *Forum Livii*.—Alfo, a town of Italy, in Lucania, S.E. of Vulci.——*Segufianorum*, a town of Gallia Celtica; now *Feuris en Forez*.——*Sempronii, Foffombrone*, (which fee,) a town of Italy, in Ombria, upon the Metaurus, S.E. of Urbinum Metuarenfe.——*Statielliorum, Villa de Fo*, a town of Italy, in Liguria.——*Tiberii, Keyferftulh*, Germ. denoting the throne of Cæfar, a town of Gallia Celtica, belonging to the Helvetians, fituated on the Rhine, not far from the frontier of the Rhætii and Vindelicii.——*Truentinorum*, a town of Gallia Cifalpina, in Emilia.——*Vibii*, a town of Gallia Cifalpina, in the country of the Taurini.——*Voconii, le Canet*, a town of Gallia Narbonnenfis, 22 miles W. of Forum Julii. When the fenate of Rome was delivered from the horror of profcriptions, it caufed to be erected in this place a temple to Clemency, in which they fet up the ftatue of this virtue, together with that of Cæfar, to whom fhe prefented her hand.——*Vulcani, Solfatara*, a place of Italy, in Campania, near Puzzuoli. Pliny calls it the the Campi Phlegræi.

FORWARD, a word of command, ufed in our *Military Tactics*, when it is intended that fections, platoons, or battalions, &c. fhould advance in that direction to which they are at the time fronted. Forward-wheeling is likewife ufed in contradiftinction to backward-wheeling, as explained under the heads of EVOLUTION and TACTICS. The former caufes the wheeling body to be thrown in advance of its former pofition; the latter places it behind the line it had occupied. The many inconveniences attendant on wheeling forward have occafioned that mode to be lefs ufed than formerly; wheeling backwards being found to anfwer far better in all cafes where there may be fufficient fpace towards the rear to admit of the feveral fections, platoons, &c. being thrown back. No larger body than a grand divifion, which we fuppofe to contain nearly 200 men, ought ever to wheel forward; nor more than a fingle company, rated at 100 men, to wheel backward.

FORZA DE AGRO, in *Geography*, a town of Sicily, in the valley of Demona; 20 miles S. of Meffina.

FORZA, *St. Leonardo*, a town of Naples, in the Abruzzo Citra; 6 miles E.S.E. of Valva.

FOS DI NOVO, a town of Etruria, and capital of a marquifate, to which it gives name; 4 miles E. of Sarzana.

FOSCAGNO, a town of Italy, in the county of Bormio; 8 miles N.N.W. of Bormio.

FOSCARINI, MICHAEL, in *Biography*, a noble Venetian, born in 1728, was employed by his government to continue the hiftory of Venice by Nani. His part of the work forms the tenth volume of the "Collection of Hiftorians of Venice." It is in 4to., and was publifhed in the year 1718. He died in 1692, leaving likewife behind him two novels, which are printed among thofe of the Academy of Incogniti.

FOSENO, in *Geography*, a fmall ifland in the North fea, near the coaft of Norway. N. lat. 60° 45'.

FOSEY, a town of Bengal; 20 miles S.S.E. of Mahmudpour.

FO-SHAN, or FO-CHAN, a village of China, fo called becaufe it is not inclofed by walls, and has not a particular governor, although it carries on a great trade, and contains more houfes and inhabitants than even Canton itfelf. This village, which is diftant four leagues from Canton, is reckoned to be three leagues in circumference, and to contain a million of inhabitants, who are occupied in various manufactories.

FOSS, or FOSSE, a river of England, which runs into the Oufe, near York.

FOSS *Navigation*, is the parliamentary name of an inland navigation, purfuing the courfe of the Fofs river in the North Riding of Yorkfhire, from the Oufe river at York city, to a place called Stillington Mile. See CANAL.

FOSS, or *Foffe*, in *Fortification*, a French word, literally meaning a ditch, adopted in our language, and efpecially applied to the ditch or moat furrounding fortified places, or made in the front of entrenchments, &c. for the purpofe of preventing furprize, and of protracting the defence made by the garrifon. Under the head of CONSTRUCTION, *Military*, the proper dimenfions and form of that excavation which furnifhes foil for the formation of the ramparts, and which becomes the foffe, will be found exemplified according to the fyftems adopted by the moft eminent engineers; it would therefore be fuperfluous to repeat in this place all that interefting detail which under the ticle referred to may be feen, not only abftractedly, but according to the feveral relations the foffe bears to the feveral members of the fortification. Here we fhall confine ourfelves to a few remarks relating to the advantages attendant upon dry and upon wet ditches.

Wherever the opportunity may offer, it fhould be made a rule to conftruct the ditch fo that it could be filled with water at pleafure. For this purpofe, ample fluices ought to be laid, fhutting with gates in the ordinary manner, but effectually fecured from the enemy; who might otherwife choak the channels, and prevent the gates from opening; or, if it fhould better fuit their purpofe, might open the gates, fo as to allow the water to retire with an ebbing tide, &c. Much will depend on the manner in which that part of the ditch lying between the curtain and the raveline in its front, may be occupied. If there be a tenaille, and that it be intended to keep that fpace dry, fo as to allow of large bodies of troops proceeding from the principal, or body of the place, to the tenaille, and from that to the raveline, or *vice verfâ*, it will be neceffary to throw up embankments in the form of *demi-caponnieres*, from that part of the revetement under the orillon, to the interior line of the rampart; thus cutting off the flow of water, and confining it to thofe parts of the ditch in front of the feveral baftions, and under the ravelines, &c. into all which it fhould flow through proper arched channels.

The embankment above-mentioned is called a *batardeau*, and is ufually furnifhed with a row of very ftout palifades, which being below the ordinary level of thofe fhots directed at the flanks of the baftions, commonly efcape injury until the enemy may be able to make a lodgment on the creft of the glacis. Of courfe, under proper precautions, the batardeau proves an efficient means of preventing any *coup de main* in that quarter from fucceeding.

In order to ftrengthen the defences ftill more, it is common to fink channels called *eunettes*, or *cuvettes*, in the centres of the ditches, parallel with the faces of the baftions. Thefe

These should be from 14 to 16 feet wide, and about nine or 10 feet deep; the sides being lined with masonry: the cunette is ordinarily kept full of water, and proves an admirable preserve for large quantities of fishes; which being under the notice of various centinels, are not subject to be poached. The cunette is likewise a great check upon those who may be disposed to desert, and serves as a formidable impediment to the smuggling of spirits, &c. into the body of the fortress.

It must be obvious that a wet ditch must present numerous obstacles in the way of the besiegers, who cannot always command the means of passing a fossé from 30 to 50 yards broad, perhaps from 12 to 24 feet deep, and having a cunette sunk along its centre; even though they should have breached the flanked angles of a bastion, and made a lodgment in the covert-way. But, on the other hand, the difficulty of maintaining the communication between the body of the place and the outworks during a siege, when the bridges are ordinarily much damaged, and perhaps rendered unserviceable, is a great drawback on this kind of defence. The embarrassments to which such a circumstance as the want of a competent bridge may give birth, must be too obvious to require any detail. A dry ditch affords considerable convenience to the garrison, not only in the ordinary way of communication, but it enables large bodies of men to pass freely, and with far less exposure than on a bridge, to and fro; so that a sally may usually be made with promptness and secrecy. Should the enemy possess themselves of a raveline, the defenders may escape into the ditch by means of small escaliers of masonry, commonly called *pas de sourés*, and take shelter in the tenaille, if there be one; otherwise they may retire into the flanks of the bastions by means of escaliers concealed behind the orillons. In a wet ditch no additional works can be constructed; whereas, in a dry one, such retrenchments, or even redoubts, may be raised, as may not only give the enemy considerable trouble, but eventually serve to dislodge him, or to render what would otherwise have proved important acquisitions, perfectly useless and unavailing.

But in some situations it is impossible to keep a fossé of proper depth free from water; while in others, whether owing to the looseness of soil, or to the elevation of the works above the ordinary level of the country, it is equally so to obtain any adequate depth of water. Besides, in such elevated situations, it may often be in the power of the enemy to drain off the water. Where a very ample body of water can be retained above the ordinary level of the country, and the surrounding plain contiguous to the defences may lie very low, it may be sometimes practicable to let off the water suddenly, thereby to form a morass, such as must give the besiegers infinite trouble.

FOSS, *Advance*. See ADVANCE.

FOSS, *Van*. See VAN.

FOSS-*way*, is one of those celebrated great roads, that traversed this island at a very early period of its history, vestiges of which are traceable in various districts; while, in others, they have been obliterated by the progress of cultivation, or the direction of the lines coalescing with the present turnpike roads. It has been generally admitted by antiquarian topographers, that four principal ways, or streets, as they have been usually termed, extended from several points of the compass, and, passing through the interior, formed lines of communication with the opposite coasts. But the accounts given of them are so obscure and contradictory, as to form a very inadequate clue for pursuing their course with desired exactness; while the destructive hand of time, and the labours of husbandry, by daily diminishing their remains, render the task of ascertaining the bearing progressively more difficult. The four great roads were the Hermine or Ermine street; the Icknild or Ricknild street, the Watling street, and the Fossway. Besides these, there were two other great roads, but of less extent, *viz.* the Via Devana and the Julia Strata; with numerous cross and connective communications, denominated vicinal ways, which were the means of intercourse between the several stations; the names and distances between which formed the subject of the curious topographical work, the Itinerary of Antoninus.

As to whom these early great national improvements are attributable, no doubt can be fairly entertained: for, though Ranulphus Higden, in his Polychronicon, ascribes them to Molmutius, a British king; and a manuscript, entitled Eulogium, preserved in the Cotton collection, adduces them as the work of Belinus, the son of Molmutius; and these opinions have been adopted, without examination; yet from the accounts given of the labours and improvements of the Romans, while in possession of Britain, and the internal evidence arising from the construction of the roads, they are decidedly referable to that ingenious people. It is well ascertained, that the Roman method of forming roads was to lay the foundations deep, and to use such durable materials that they became perfectly solid buildings, and so compact that they could not have been more firm if vaulted and arched. A section made of a portion of the Foss-way, for the purpose of discovering the mode of construction, and the kind of materials used in these roads, afforded the following result: Stones, clunch, hard gravel, indurated clay, and various other kinds of earth, in layers, like the strata observable in mines; a layer of clay was succeeded by a substance of a binding quality, then a layer of flat stones, next chalk, over which was laid rough gravel, till the road was raised from six to eight feet in height, and the top crowned or coped with a ridge, gently rising from the sides to the centre, that the rains falling upon it might run off, lest by soaking in they might soften the cementing bodies, and injure the work. Similar substances and plans of construction have been apparent in the other great roads, in places where they have been broken up, to take the materials for repairing adjacent highways.

These must have been arduous and expensive undertakings, at a time when the country was in such an unimproved state, that the very attempt to remove the difficulties of communication was a striking proof of their existence and inconvenience. But the Romans, as lords of the countries they conquered, possessed the wealth of labour to a vast extent: they had the command of the natives, their carriages and cattle; while the soldiers also, when unoccupied in military expeditions, were constantly employed in works of public utility. If, therefore, the requisite materials lay at a considerable distance, they had the means of procuring and transporting them to the desired places: and such was the enterprising and decided character of that people, they would have whatever constructive materials they might choose, that their works, as bridges, roads, aqueducts, fortifications, &c. should be grand and magnificent like themselves.

Respecting the bearing of these roads, much has been advanced by historical and topographical writers; and it still forms an interesting subject of antiquarian research. A manuscript, marked Nero D I, among other additamenta at the end of Matthew Paris's works, in the British Museum, contains a rude draught and description of these roads, which, from recent discoveries, and attempts to ascertain their respective lines and bearings, appears tolerably correct.

correct. In this plan, the Hermine or Ermine ſtreet is represented as proceeding from the ſouthernmoſt part of the iſland, directly north; the Icknild or Ricknild ſtreet, in a line from eaſt to weſt; the Watling ſtreet, from Dover to Cheſter; and the Foſs-way, from Totneſs in Devonſhire to Caithneſs in the north-eaſt of Scotland. But as it does not appear that the Romans ever penetrated further north than the ſouthern bank of the river Tay, it is more probable that this, like the Hermine ſtreet, terminated at the Linea valli, or Roman wall. The ſouthern end perhaps might have been at the city of Exeter, the Iſca Danmoniorum of the Itinerary, and the ſtation where the legio ſecunda of the Roman army was quartered, while their operations were confined to Britannia Prima. Of the track the Foſs-way made through the counties of Devon and Somerſet few veſtiges have been diſcovered. It has been traced in the vicinity of Bath, the Aquæ Solis of Antoninus, where it was met by another road, which, coming weſtward from the Severn, formed a continuation of the Julia Strata. Entering Wiltſhire, the Foſs paſſes North Wraxal to Shireſtone, and leaving Tetbury about a mile and a half to the eaſt, enters Glouceſterſhire, near the village of Kemble, proceeding to the ſtation of Durocornovio, the preſent town of Cirenceſter; where it is traverſed by another Roman road coming from the ſouth-eaſt, on which are the ſtations deſcribed in the fourth Iter; and which is ſtill recorded by the names of ſeveral places on the line retaining the Britiſh name of *Sarn*, equivalent to the Latin *ſtratum*, *viz.* North and South Sharncote, Sharnton, Sarney, &c. The progreſs of the Foſs from Cirenceſter is through Northleach, Slaughter, Stow-on-the-Wold, Moreton-in-Marſh, and Lemington, where it receives a vicinal, or croſs road, leading, according to Dr. Plot, from Woodſtock in Oxfordſhire. Leaving Lemington, and paſſing Stratton-in-the-Foſs to Whitchurch, it enters Warwickſhire at Stretton-ſuper-Foſs. Along this part of the line it is very conſpicuous, running through an iſolated part of Worceſterſhire, croſſing the river Stour at Hawford; and a little to the weſt of Compton, Combrook, and Lighthorn, it leads to a large Roman encampment at Cheſterton, near which it takes a direction over the river Leam, on the eaſt of Honingham, to Upper Stretton; whence it is very viſible over Dunſmore heath, in its courſe to Britford-upon-the-Avon; and going by the village of Brinklow, through Stretton-under-Foſs, where it appears like an open ditch, the materials having been taken away for repairing ſome adjacent road; and leaving Monk's Kirby on the eaſt, it bids adieu to this county at Highcroſs, interſecting the Watling ſtreet at nearly right angles, at which junction was the ſtation Bennonæ. Through Leiceſterſhire it ſhapes its courſe almoſt parallel with the river Soar near Sharnford, which derives its name from the road, as did the places previouſly mentioned in Glouceſterſhire, and appears very conſpicuous in Greenlane, over the incloſures to Narborough; it then coaleſces with the preſent turnpike, and continues with it till within the diſtance of four miles from Leiceſter, and croſſing a branch of the Soar at Langham bridge, it enters by the weſt gate of the town, the ancient ſtation Ratæ of the Itinerary. Leaving the county town, and going through Thurmaſton, it paſſes by a large oblong tumulus at Shipley hill to Syſton, and beyond Ratcliff proceeds over Thruſſington Wolds, which Higden termed the Waſtes, keeping near the verge of the diſtrict formerly called Churn wood, to Soxhill, where are another large tumulus; and the remains of an entrenched camp. Here it is viſible as a high ridge, which in many places is paved, or pitched with pebbles and other ſtones, and is interſected by a vicinal road, that connects it with the Hermine-ſtreet. Hence it proceeds to the ſtation Vernometum, near Willoughby in Nottinghamſhire; through this county it proceeds in a northerly direction over the Wolds, whence deviating a little to the north-eaſt it enters Bridgeford, the ſtation Mardunum of the ſixth and eighth iters; beyond which it is traceable on the weſt ſide of the preſent turnpike, in the incloſures called Eaſt-Bridgeford fields. Horſley, in his Britannia Romana, having fixed the ſtation Ad Pontem, near Southwell, carries the Foſs through that town. But the ſcite of this ſtation was more probably at or near Newark, by which, according to exiſting records, reſpecting alterations allowed to be made in the road, called in the charters, Via regia, the Foſs evidently paſſed. North of the town it is viſible, proceeding to North Collingham, where Gale and Stukeley fix the ſtation Crocolana, and Horſley at Brough in the immediate vicinity. Between this and Lindum, Lincoln, it is very conſpicuous; at which city, by ſome authors, the Foſs is ſuppoſed to terminate. But Dr. Bennet, biſhop of Cloyne, and the Rev. Mr. Lemon, who in the years 1778 and 9, travelled in queſt of the direction of the Foſs, from its commencement in Devonſhire, obſerve that it extends in a north-eaſterly direction from that ancient city by Burgh, on the ſmall river Bain, to Ludford, where they ſuppoſe was the ſtation Bannovallum. But this has every appearance of being only a vicinal way, and the road in queſtion more probably continued northerly on the line which they conſider forms part of the Hermine-ſtreet; an error which will be noticed in the deſcription of that road. In this point of bearing it proceeds to the ſtation Ad Abum at Wintringham, where by a ferry it croſſes the Humber. On this part of the line, which is ſtraight, the road is, in many places, particularly through the Woodlands, paved with flat-ſtones, ſet edge-wiſe in a ſtrong cement, and conſiderably raiſed; but over the heath it is formed of the uſual ſtrata. By the ferry of Ad Abum its progreſs was to the ſtation Delgovitia, at Wigton, whence it went to Eboracum, York. What was its exact direction, or how far beyond this ſtation it extended north, the reſearches of antiquaries have not been able to aſcertain. It is probable, that the termination was at the Picts wall; but equally improbable that it ever communicated with the ſhore of Caithneſs.

See Cotton MSS. in the Britiſh Muſeum; Leland's Itinerary; Stukeley's Itinerarium Curioſum; Horſley's Britannia; and the Beauties of England and Wales.

FOSSA, in *Anatomy*, a technical word, denoting ſuperficial cavities in the bones or other parts.

Fossa, in our *Ancient Cuſtoms*, was a ditch full of water, where women committing felony were drowned; as men were hanged. "Nam et ipſi in omnibus tenementis ſuis omnem ab antiquo legalem habuere juſtitiam, videlicet ferrum, foſſam, furcas, et ſimilia." In another ſenſe it is taken for a grave, as appears by theſe old verſes:

> "Hic jacent in foſſa Bedæ venerabilis oſſa:
> Hic eſt foſſatus, qui bis erat hic cathedratus."

Fossa, in *Geography*, a town of Italy, in the department of the Panaro; three miles N. of Mirandola.

Fossa *Clodia*, or *Claudia*, *Chiozza*, a town of Italy, in Venetia. Pliny.

Fossa *Nuova*, in *Geography*, a village and abbey of Italy, ſituated on the ruins of the little town of Forum Appii, mentioned in the Acts of the Apoſtles, and by Horace in his account of his journey to Brunduſium.

> "—— Inde Forum Appii
> Differtum Nautis, cauponibus atque malignis."

"To

"To Forum Appii thence we ſteer, a place
Stuff'd with rank boatmen, and with vintners baſe."
Francis.

In the memoirs of St. Thomas Aquinas it is ſaid, that he was taken ill as he paſſed this way, and was carried to this convent, where he died. Legendary ſtory ſays, that his body was afterwards required by the king of France, and ordered to be carried to Thoulouſe: but one of the monks, before the removal of the body, cut off the ſaint's head, and annexed another in its room: the true head was hid in the wall of the convent, and afterwards found, as the monkiſh fable reports, as freſh as the day when it was cut off, in conſequence of ſome ſcratching and knocking which occaſioned the walls being pulled down. Foſſa Nuova is two miles S. of Piperno.

FOSSAGLIO, a town of Italy, in the department of the Upper Po; five miles N. of Cremona.

FOSSANO, a town of France, in the department of the Stura, ſeated on the Stura, denominated, on account of its famous ſprings, "Fons Sanus," whence by corruption was formed Foſſano; erected into a biſhopric, under the archbiſhop of Turin in 1592, and taken by the French in 1796. Beſides the cathedral, it contains three pariſh churches, three convents, and about 900 inhabitants; five miles E. of Savigliano.

FOSSARII, in *Antiquity*, a kind of officers in the eaſtern church, whoſe buſineſs was to inter the dead.

Ciaconius relates that Conſtantine created 950 foſſaries, whom he took out of the divers colleges or companies of tradeſmen: he adds, that they were exempted from taxes, ſervices, burthenſome offices, &c.

F. Goar, in his notes on the Greek Euchologion, inſinuates that the foſſarii were eſtabliſhed in the times of the apoſtles; and that the young men who carried off the body of Ananias, and thoſe perſons full of the fear of God, who interred St. Stephen, were of the number.

St. Jerom aſſures us, that the rank of foſſarii held the firſt place among the clerks; but he is to be underſtood of thoſe clerks only who had the direction and intendance of the interment of the devout.

FOSSAT, in *Geography*, a town of France, and chief place of a canton in the department of the Arriege, and diſtrict of Mirepoix; 21 miles W. of Mirepoix. The town contains 889, and the canton 9578 inhabitants, on an extent of 170 kiliometres, and in 10 communes.

FOSSE, Charles La, in *Biography*, a painter of hiſtory and landſcape of great celebrity in France, but not very juſtly entitled to his fame; as may be ſeen by one of his works now on a cieling at the Britiſh Muſeum, painted originally at the command of Ralph, duke of Montagu, in the reign of James II.

He was born at Paris in 1640, and was a diſciple of Le Brun; but was afterwards ſent by Louis XIV. to ſtudy in Italy. He formed his taſte more upon the Venetian than the Roman ſtyle; for which reaſon his works have far leſs of correctneſs in drawing, than richneſs of colour; and by this means, perhaps, he obtained a good reputation, when more ſkilful men, whoſe talents were directed to higher objects, would have been neglected. We have particularized him here becauſe he was the artiſt employed to decorate Verſailles, Trianon, Marly, and the palaces of many of the nobility of France, when it was the faſhion to load ſtaircaſes and cielings with abſurd allegories and taſteleſs compoſitions of groteſque ſcenery. La Foſſe died in 1716, aged 76.

Fosse, Anthony de la, was born at Paris in 1653. He devoted himſelf to polite literature, and obtained conſiderable reputation as an author. He is known alſo in the political world as ſecretary to the marquis de Crequi in the war in Italy, and after this to the duke d'Aumont in his government of the Bolonnois. He wrote Italian with the utmoſt facility, and ſo well, that for an ode, which he compoſed in the language, he was received into the Academy Degli Apatiſti at Florence. His chief literary compoſitions were tragedies, ſeveral of which, particularly that entitled "Manlius Capitolinus," were ſucceſsful on the ſtage. He tranſlated, or rather paraphraſed, Anacreon, which was publiſhed with ſome miſcellaneous poetry in the year 1704. He died in 1708. His works were publiſhed in two vols. 12mo. in 1755. The verſes of La Foſſe are extremely laboured, and are ſaid to have coſt him more pains in expreſſion than in the thought. Moreri.

Fosse, in *Gardening*, is a ſort of ſunk fence, large ditch, or *ha-ha*, made on the outſides or boundaries of ornamented grounds, in order to extend the proſpect in an uninterrupted manner. Fences of this nature are formed of different depths and breadths, according to circumſtances; but ſix or ſeven feet in depth, and ten or fifteen in width, are the moſt common. Where the extent of pleaſure-ground is inconſiderable, theſe fences give the particular parts of the garden or grounds an air of larger extent than they really poſſeſs; as at a diſtance nothing of them is ſeen, ſo that the adjacent fields, &c. appear to be connected with them: where the pleaſure-ground is ſituated near to a park, paddock, or any ſpacious field open to an agreeable proſpect, they are often continued round, as far as they are agreeable, from the walks of the pleaſure-grounds or other garden grounds.

Works of this kind are formed in different ways, but always ſo as to ſerve the purpoſe of fences, and afford an uninterrupted view of the whole extent of the ground.

One method of conſtructing them is with an upright ſide next the garden or pleaſure-ground, or in the contrary direction, according to circumſtances and ſituation, five, ſix, or ſeven feet deep, faced with a wall of brick, ſtone, or ſtrong poſt and planking; the other ſide being made ſloping outward from the bottom of the upright wall, &c. gradually, with an eaſy ſlope of fifteen or twenty feet diſtance, or more, ſo as to render the declivity as eaſy and imperceptible as poſſible, both to take off all ſtiff and ditch-like appearance, and that when in a field or park, no ground may be loſt from its being capable of being converted into graſs. The top of the upright ſide ſhould be made nearly upon a level with the adjacent pleaſure-ground, and always a little higher than the top of the ſlope on the oppoſite ſide, being laid with graſs correſponding to the adjoining garden or pleaſure-ground; unleſs it be thought convenient to continue a gravel-walk that way; in which caſe, a proper verge of graſs ſhould conſtantly be preſerved between the walk and the edge of the foſſe; the ſlope ſide ſhould alſo have its top always nearly on a level with the adjacent ground of the field, park, or part where it is formed; and the ſide finiſhed with a regular ſlope from top to bottom, being alſo ſown or laid down in graſs, which will always preſerve the ſlope in due form, and have an agreeable appearance to the ſight at all ſeaſons.

Where in forming this kind of foſſe, by reaſon of water it cannot be got deep enough to form the upright ſufficiently as a fence, a *chevaux de friſe* of wood-work may be erected along the top, projecting outward in a nearly horizontal poſition, or as much ſo as to riſe but very little above the level of the top of the perpendicular ſide on which it is fixed, that it may not obſtruct the view, or be very perceptible

perceptible from the garden or pleafure-ground, which it is intended to improve.

There is another fence of this fort which is formed with both fides floping, and in perpendicular depth from four to five or fix feet, having a fence near that height arranged along the bottom; the fides being floped gradually from the bottom to ten or twenty feet width, or more at top; as the more eafy and imperceptible the flope the better, particularly on the field-fide. The fides muft be fown or laid with grafs. In this, as both fides are floped, a fence along the bottom is neceffary as a defence againft cattle, &c. which may be either ftrong paling, or any kind of palifado-work, the height in proportion to the perpendicular depth of the funk fence, as the top fhould not be higher than that of the flopes in fuch cafes.

It is ufual, in conftructing the firft fort of fences of this nature, to begin by fetting out the intended width by two ranges of fhort ftakes; then to level in the ftakes by notching, according to the intended height of the top on each fide, correfponding with the adjacent ground, making up both the top lines with earth firmly, according to the line of level marked on the ftakes; then, clofe along the fide of the line of the intended upright fide, proceeding to dig a trench three feet wide, perpendicularly to the intended depth; and as the labour goes on to work alfo the floping-fide gradually down, ftill continuing digging the trench perpendicularly next the garden, &c. till arrived at the proper depth: when it is neceffary to level the bottom equally along according to the lines of level at top; and having proceeded fo far, then, according to the line of level at top and bottom, to trim and finifh off the floping fide regularly, fo as to form an even flope from the outfide line at top to that at bottom: as to the upright fide, a wall muft be erected to the height of the line of level at top, making good the ground behind the wall firmly as the building advances, and finifhing the top with a coat of turf, level with the adjoining ground; at the fame time alfo finifhing the flope, either by fowing it with grafs-feeds, or laying it with turf, as may be the moft convenient in the particular circumftances.

But in forming the fecond fort of foffe, it is directed to fet out the width by two lines of ftakes; then to level them in, and make up the ground of each line according to the mark of level, as before; thus, exactly along the middle, between the two lines of ftakes, to dig a trench two or three feet wide, to the intended depth of the fence, floping each fide a little as the work goes on, ftill continuing the trench perpendicularly, till arrived at the due depth; then, as in the former cafe, to level the bottom to an equal depth by ftakes, agreeable to the lines of level at top: when this is effected, finifh off both flopes evenly from each line of level at top to that at bottom, and fow each flope with grafs-feeds, or lay them with turf, as moft proper. The fence along the bottom may be either clofe-paling, rails, or palifadoes, as moft convenient; the height proportionable to the depth of the foffe, but not higher, or at leaft but very little, than the line of level at the top of the foffe.

In the execution of the work in both cafes the internal materials fhould be well trodden down, or rammed in, in order that the whole may be rendered perfectly folid, and prevented from finking irregularly and being thrown down.

FOSSENET, in *Geography*, a town of France, in the department of the Upper Garonne; 7 miles W. of Rieux.

FOSSES, a town of France, in the department of the Sombre and Meufe, and chief place of a canton in the diftrict of Namur, fituated between the Sombre and the Meufe; 7 miles W. of Namur. The town contains 1574, and the canton 13,780 inhabitants, on a territory of 270 kiliometres, and in 25 communes.

FOSSETA, a town of Italy, in the Trevifan; 12 miles E.S.E. of Trevigio.

FOSSILS, in *Mineralogy* and *Geology*, a term which, in its ftrict and ufual fignification, is fynonymous with that of *mineral*; being applied to the inorganic bodies that are formed in, and at the furface of the earth, according to phyfical and chemical laws. (See MINERALS.) The French, we fuppofe, were the firft who diftinguifhed by this appellation thofe animal and vegetable remains that, owing to particular circumftances, inftead of decaying when buried in the earth, have more or lefs preferved their original form and ftructure, and are found penetrated by, or even converted into, fubftances belonging to the mineral kingdom. Thefe fubftances, before their natural hiftory began to be elucidated, were denominated *lapides idiomorphi*, *figurati*, *diluviani*, &c.; but fuch names foon gave way to that of *petrifacta*, or *petrifactions*, which was adopted in almoft all languages. In latter times, however, the denominations *extraneous* or *adventitious foffils*, propofed for this order of natural bodies by fir John Hill, have been revived by fome authors. Mr. Parkinfon, confidering the word "petrifactions" inadmiffible as a general term, recommends the appellation of "fecondary foffils," while "primary foffils" are to him thofe fubftances which are fuppofed to be natives of, and to have exifted primitively in, the fubterranean regions. Mr. Martin, in his "Outlines," prefers the terms *reliquium* and *reliquia* (which fhould be *reliquiæ*). But neither of them appearing fatisfactory, we fhall, in this work, retain the old appellation *petrifactions*; to which we refer the reader for a hiftory of the fubftances in queftion: for though we are aware that its etymology refers only to a converfion into ftone, yet in this, as in many other cafes, recourfe muft be had to the well known rule *a potiore fit denominatio*. And, indeed, even thofe writers who reject the word "petrifactions" as not fufficiently general, retain another of the fame import in all the generic names of the extraneous foffils, fuch as ornitho*lithus*, ichthio*lithus*, helmintho*lithus*, &c.

FOSSIL-*plant*. See PLANT.

FOSSILS, *Marine*. See MARINE.

FOSSIL-*ivory*. See IVORY.

FOSSIL-*falt*. See SALT.

FOSSIL-*wood*. See WOOD.

FOSSIL *Coal*, in *Agriculture*, an inflammable fubftance which is faid to be capable of being rendered foluble by faline fubftances, in which ftate it may probably be found beneficial to the farmer.

FOSSIL *Manure*, is that fort which is of a foffile nature, and which is raifed from the bowels of the earth. Lime, marle, and other fimilar fubftances, are moftly confidered as of the foffil kind by writers on hufbandry.

FOSSOMBRONE, in *Geography*, a town of Italy, in the duchy of Urbino, feated on the Metro; the fee of a bifhop, fuffragan of Urbino; erected out of the ruins of Forum Sempronii, which was deftroyed by the Goths and Lombards; 10 miles S.E. of Urbino. N. lat. 43° 42'. E. long. 12° 44'.

FOSSORES, in *Natural Hiftory*, a name given to a fpecies of fmall worms hatched from the eggs of a fly, which feeds on the parenchymatous fubftance of the leaves of plants, burying themfelves between the two membranes. Thefe animals in general are called by Reaumur afcarides,

but as they greatly differ in their ſize, and in their manner of eating and deſtroying leaves, the ſmall ones, which eat but ſlowly, and gnaw their way in crooked furrows, are called by him foſſores parvi; and on the contrary, thoſe which eat away all that lies before them, and are of a somewhat larger ſize, are called foſſores magni. See ASCARIDES.

FOSSUM, in *Geography*, a town of Norway, in the dioceſe of Aggerhuus; 23 miles W. of Chriſtiania.

FOSTA, a town of Sweden, in the province of Smaland; 21 miles E. of Upſal.

FOSTAL, in *Agriculture*, is a term ſignifying the way that leads from the main road to a farm-houſe.

FOSTAT, called alſo *Maſr* and *Maſr-el-Atik*, and by the Venetian merchants, and ſome modern travellers, *Old Cairo*, in *Geography*, a town of Egypt, ſituated between Grand Cairo and the Nile, about half a league from Boulac. In the 20th year of the Hegira, ſays Elmazin in his hiſtory of the Arabs, Amron, ſon of Eleas, built Maſr Foſtat on the ſpot where he had formed his camp, previouſly to his beſieging Alexandria. The general, on his return from his conqueſts, laid the foundation of a town there, to which he gave the name of "Foſtat," ſignifying in Arabic "tent." Afterwards the governors ſent by the caliphs made it their place of reſidence. It took the ſurname of "Maſr" as it is ſaid, from Mizraim, the ſon of Ham, who ſettled in Egypt; a name which Memphis had borne before, and which the Arabs always beſtow on the capital of Egypt. Its ſituation on the banks of the Nile, and near a canal that communicated with the Red ſea, rendered it in a ſhort time very flouriſhing. It was about two leagues in circumference, when Schaouar, 500 years after its foundation, delivered it up to the flames, in order to prevent its falling under the dominion of the French. Its power terminated with this epocha. With its inhabitants, it loſt its commerce and its riches. It was then that Grand Cairo, having become the reſidence of the grandees and the kings of the country, received the pompous epithet of Maſr; and that Foſtat aſſumed that of El-Atik, which ſignifies "the ancient," and which it bears at this day. Maſr-el-Atik is not now half a league in circumference; but it is ſtill very populous, and has conſiderable trade. This town indicates the ſcite of the Babylon of Egypt; and it is the port for the boats that come down from the Said, or Upper Egypt, as Boulac is that of the Delta. Here, in the midſt of the Mahometan moſques, the Jews have a ſynagogue, and the Catholics a convent and a church; but the Copts have reſerved to themſelves that which is reckoned by the devout the moſt precious ſpot: this is a grotto, or low chapel, in which, according to tradition, the virgin lived ſome time with the infant Jeſus, when they were obliged to flee into Egypt. This tradition is a ſource of profit to the Copts, who charge fees for admiſſion into this chapel. At Old Cairo are to be ſeen Joſeph's granaries, if this appellation may be given to a large ſpace of ground, ſurrounded by walls 20 feet high, and divided into courts without any roof or covering; in which is depoſited the corn brought from Upper Egypt as the fiſcal duties, and where it becomes the food of a multitude of birds, and the receptacle of their dung. The walls are badly conſtructed; nor has this building any appearance of antiquity, ſo that nothing but the love of the marvellous could have attributed the erection of it to the patriarch Joſeph. Another work of the Arabs, which is remarkable for the boldneſs as well as the beauty of its conſtruction, and the only one worth ſeeing in the ancient city of Cairo, is the aqueduct that conveys the water of the Nile into the caſtle. It is ſupported by 350 narrow and very lofty arcades. The water is raiſed by a chain-pump with four wheels, which is worked by oxen. In front of Old Cairo the Nile leaves, in the middle of its bed, an iſland of about five hundred yards in breadth, where is built the "mekkias," ſignifying Meaſure. See NILOMETER. At the extremity of Maſr-el-Atik, near the water-caſtle, commences the khalig or canal, which traverſes Grand Cairo. See CAIRO.

FOSTER, JAMES, in *Biography*, a celebrated preacher, was born at Exeter in the year 1697, where he was educated; and ſo great was his progreſs, that the maſter of the ſchool boaſted of him as his moſt promiſing pupil; from the grammar ſchool he was ſent to an academy for educating diſſenting miniſters, then under the ſuperintendance of Mr. Joſeph Hallet, where, by his abilities, induſtry, and improvement, he quickly acquired the admiration of his tutor and fellow ſtudents. He commenced public preacher in the year 1718, and was ſoon diſtinguiſhed among his brethren for popular talents. At this period, debates among the diſſenters in the weſt of England ran high reſpecting the doctrine of the trinity and ſubſcription to certain teſts of faith. Mr. Foſter took the liberal ſide of the queſtion: he ſcorned to dogmatize over the creeds of other men, and would not ſuffer the tenets of others to be impoſed on him; a clamour was excited, and he judged it prudent to remove to ſome other ſcene. His firſt ſettlement as miniſter was with a congregation at Milbourne-port, Somerſetſhire, where he remained till the zealots among his own people rendered the ſituation uneaſy, perhaps, even unſafe, and he accordingly removed to the houſe of a brother miniſter in an obſcure retreat under the hills of Mendip in the ſame county. Here he preached to two congregations, who were ſo poor, that, together, they could not raiſe their miniſter 15*l. per annum*. Mr. Foſter was, however, content to remain in obſcurity, and in want of the comforts of life, provided he could enjoy the ſatisfaction which aroſe from his integrity. He found abundant reſources in his own mind, and, though without any proſpects of extended uſefulneſs, applied himſelf to the ſtudies of his profeſſion with an almoſt unremitted appplication. In the year 1720 Mr. Foſter publiſhed "An Eſſay on Fundamentals, with a particular regard to the doctrine of the ever-bleſſed Trinity," &c. To this eſſay he ſubjoined a ſermon, entitled "The reſurrection of Chriſt," proved and vindicated againſt the moſt important objections of the ancient Jews, or modern deiſts, and his diſciples ſhewn to be ſufficient witneſſes of the fact. From Aſhwick Mr. Foſter removed to Trowbridge, in Wiltſhire, where he preached to a very ſmall congregation; and during his reſidence at this place he became a convert to adult baptiſm by immerſion, and accordingly ſubmitted to that rite in London as ſoon as an opportunity offered. This ſtep produced no difference between him and his congregation at Trowbridge; ſo ſmall, however, was his income, and, probably diſheartened at the paucity of his attendants, that he entertained ſerious thoughts of quitting the miniſtry, and betaking himſelf to ſome ſecular employment. While deliberating on the future courſe of his life, he unexpectedly met with a patron and friend in Robert Houlſton, eſq. who appointed him his domeſtic chaplain, and treated him with the utmoſt kindneſs and generoſity. In 1724 he was invited to ſucceed Dr. Gale at the baptiſt congregation in Barbican: he accepted the offer, and continued to officiate as their miniſter upwards of twenty years. In 1728 he opened a Sunday evening lecture in the Old Jewry, which he carried on almoſt to his death with an unexampled degree of popularity. Here he was attended by crowds of perſons of all ranks, ſtations, and qualities. In the year 1744 he was choſen

chosen to succeed Dr. Hunt at Pinners' hall; and in 1748 the degree of doctor of divinity was conferred upon him by the college of Aberdeen in the handsomest way. The college, by means of their principal, said in a letter to Mr. Foster, "We beg that you will be so good as to accept the diploma as a small mark of the veneration we have for you, and of the sense we entertain of the eminent services you have done to the cause of liberty, religion, and virtue, by your writings as well as instructions." In 1750, Dr. Foster was afflicted by a violent disorder, from the effects of which he never compleatly recovered, though he continued to preach till the beginning of the year 1752, when he was attacked by a paralysis, which was repeated in October, and on the 5th of the following month he died, in the fifty-fifth year of his age. The works of Dr. Foster, to which the university in their letter referred, are, 1. His treatise on "The Usefulness, Truth, and Excellency of the Christian Revelation, &c." in answer to a book entitled "Christianity as old as the Creation." 2. Several volumes of sermons on important and interesting subjects. After this, *viz.* in 1749, Dr. Foster published in quarto the first volume of his "Discourses on all the Principal Branches of Natural and Social Virtue." The second volume of this work was printed in 1752. Besides these, he published some single sermons; and "An Account of the behaviour of the late earl of Kilmarnock, after his Sentence and on the Day of his Execution." He had attended this unfortunate nobleman during his imprisonment, and could speak, from his own knowledge, as to the facts stated in the publication. On the death of Dr. Foster, as well as during his life, the most unexceptionable testimonies were borne to the excellence of his character, and to his great talents as a preacher. The lines by Pope are well known.

"Let modest Foster, if he will, excel
Ten metropolitans in preaching well."

Those taken from the Gentleman's Magazine, and supposed to have been written by Savage, are equally characteristic and more full.

"But see th' accomplished orator appear,
Refined his language, and his reasoning clear;
Thou only, Foster, hast the pleasing art,
At once to charm the ear and mend the heart."

Mr. Rider, afterwards master of St. Paul's school, and known by several useful publications, speaking of Dr. Foster, says "His voice was naturally sweet, strong, distinct, harmonious, always adapted to his matter, always varied as his method changed, as expressive of the sense as the most judicious recitative. Monotony was a fault of which he was never guilty. His action, the soul of eloquence, was grave, expressive, free from distortions, animated without being theatrical; in short such as became the pulpit. He reminded us of Paul at Athens, arresting the attention of his auditors." He used no delusive arts to bribe the passions, to play with the imagination, and so impose on the understanding. He had no ambiguities, no disguises; but, whatever he thought an important truth, he delivered with freedom and without reserve. In private life he was distinguished for candour and liberality, integrity and modesty, great tenderness and benevolence of disposition, and unaffected ardent piety. Gen. Biog. British Biog.

Foster, John, was born at Windsor, and received his grammatical and classical education at Eton, where he acquired a decided superiority over his contemporaries. From Eton he went to King's college Cambridge, of which society he became fellow in 1748. He was afterwards an assistant to Dr. Barnard master of Eton school, and in 1765 obtained the same office himself. But finding his temper and manners ill adapted to the situation, he resigned it, though not till his health had been much injured by the vexations which he had experienced. He was presented to a canonry of Windsor in 1772, and in the following year, he visited the German Spa for the recovery of his health. Here he died and was buried in the month of September. He is known to the learned world by "An essay on the different nature of accent and quantity, with their use and application in the pronunciation of the English, Latin, and Greek languages; containing an account and explanation of the ancient tones, and a defence of the present system of Greek accentual marks." To this essay was annexed the Greek poem of Musurus, addressed to Leo. X. with an elegant Latin version. He printed likewise a prize dissertation pronounced at Cambridge in 1754, with the title of "Enarratio et Comparatio Doctrinarum Moralium Epicuri et Stoicorum."

Foster, *Sir* Michael, an eminent lawyer, was born in 1689, at Marlborough in Wiltshire, where he received the early parts of his education, and from whence, in 1705, he was removed to Exeter college, Oxford. He pursued his professional studies in the Middle Temple, and was in due time called to the bar. Not meeting with that success which he anticipated in the courts of law, he settled first at Marlborough, and then, having married, he removed to Bristol, where he practised in his profession with much reputation. He was chosen recorder of the city in 1735, and in the following year he was called to the degree of serjeant at law. About this period he published a pamphlet entitled, "An examination of the scheme of the church power laid down in the Codex Juris Eccles. Anglicani," which was regarded by the friends to the principles of the British constitution, as an important barrier against the doctrines contained in bishop Gibson's work. The controversy excited much attention, and Mr. Foster's work was read and greatly admired by one party, and opposed and answered by the other. In 1745, by the recommendation of lord chancellor Hardwicke, Mr. Foster was made one of the judges of the court of king's bench, with the honour of knighthood. In 1762, he published "A report of some proceedings on the commission for the trial of the rebels in the year 1746, in the county of Surrey; and of other crown cases, to which are added discourses upon a few branches of the crown law." This work is of the very first order, and was abundantly sufficient to perpetuate the name of the author, who is styled by sir William Blackstone, "a very great master of the crown law." It has been twice reprinted with valuable additions by his nephew, the late Mr. Michael Dodson. The health of judge Foster began to decline almost immediately on the death of his lady in 1758; but his life was lengthened out till November 7th, 1763. He was beloved in private life and respected by all who knew him. As a judge he maintained his station with great credit for legal knowledge and integrity, during a period of eighteen years, which were marked with the decision of many points of singular importance in civil and criminal law. He was looked up to as one of those judges who best sustained that spirit of independence and regard to the rights of the subject, which it is the boast of English jurisprudence to have secured upon the bench, but which are not unfrequently shackled in their exertions, by the pursuit of court favour. See the article Dodson: and Gen. Biog.

Foster, Samuel, an English mathematician, born in North-

Northamptonshire, was educated at Cambridge, where he took his degree of master of arts. In 1636 he was chosen professor of astronomy, in Gresham college, which, however, he resigned at the close of the same year; but in 1641, he was re-elected to the same office, and retained it during his life. He was one of the institutors of the society, which met to cultivate the new philosophy and useful knowledge, and which it should seem, was established for the sake of diverting the minds of the thoughtful from the disputes, which at that period divided the country with respect to religion and politics. This was the foundation of the Royal Society, to which the scientific world is under the greatest obligations. Mr. Foster died at Gresham college, in the year 1652. He was the author of several mathematical pieces, of which the principal are, "The art of dialling:" "Description of sundry instruments invented or improved by himself." His "Use of the Quadrant, &c." first appeared as an appendix to Gunter's description of the Cross-staff. The greater part of his works were republished after his death, carefully corrected by his friends Dr. Twysden and Mr. Edmund Wingate. In the same century there were two other Fosters distinguished as mathematicians, *viz.* William, a pupil of Oughtred, and author of "The circles of proportion and the horizontal instrument:" and Mark Foster, who published a treatise entitled "An Arithmetical Trigonometry by common arithmetic, without the use of Tables, &c." Ward's lives of the professors of Gresham college.

FOSTER, in *Geography*, a township of America, in Providence county, Rhode island, containing 2457 inhabitants; 17 miles W. of Providence, and 31 N. W. of Newport.

FOSTER-LAND, a term employed by our *Old Writers* to signify the land given or allotted for the finding of food or victuals; as for monks, in certain monasteries or religious houses.

FOSTERLEAN, anciently signified nuptial gifts; much the same with what we now call *jointure*.

The word is originally Saxon, and signifies *ciborum exhibitio*, that is, a stipend which the wife has for her maintenance. "Postea sciendum est cui fosterlean pertineat, vadiet hoc Brigdunia, & plegient amici sui."

FOTHER. See FODDER *of lead*.

FOTHERGILL, JOHN, in *Biography*, an eminent physician, was born at Carrend, in the county of York, on the eighth of March 1712, of respectable parents, who were members of the society of quakers. He was in his childhood placed under the care of his maternal grandfather, who sent him at a proper age to the grammar school of Frodsham, in Cheshire, where he resided. At this school he continued till his twelfth year, and was then removed to another at Sedberg, in Yorkshire, where he remained about four years, and obtained a competent knowledge of the Latin language, and some acquaintance with the Greek; and although, as he himself has been heard to acknowledge, he was not careful enough to improve the latter; yet he continued, after he left these schools, to cultivate his Latinity, so as to read authors in that language very familiarly, and to write in it with sufficient fluency. But his attention was directed rather to general knowledge, than to the study of the learned languages, which he regarded little farther than as the vehicles of profitable information. About the year 1728, he was apprenticed to Benjamin Bartlett, a very reputable and intelligent quaker apothecary, at Bradford in Yorkshire, who had previously been the tutor of Dr. Hillary. After the completion of his apprenticeship he removed to Edinburgh, where he pursued his studies with diligence, and graduated on the 13th of August, 1736. He then entered himself a physician's pupil at St. Thomas's hospital in London, the practice of which he attended for two years. After a short excursion to the continent with a few friends, in the spring of 1740, he returned to London, and took up his residence in White-hart court, Gracechurch street, where he continued during the greater part of his life, and where he acquired and established both his fame and his fortune. His practice for some years was confined chiefly to the lower class of people, so that he has often traversed the outskirts of the city from morning till night, and returned home without having taken one fee. In 1746, he was admitted a licentiate of the College of Physicians; and in 1748, he published his "Account of the putrid sore Throat;" a work, which is still highly esteemed as an able specimen of medical history, which has been translated into almost every European language, and to which he owed a considerable extension of his practice. He was now introduced into the first families in the metropolis; and was seldom employed where he was not sought for again on similar emergencies.

In 1754, Dr. Fothergill was elected a fellow of the College of Physicians at Edinburgh, and in 1763, a similar honour was conferred upon him by the Royal Society of London, to whom he had, several years before, communicated some interesting papers, which were inserted in different volumes of their Transactions. These were not the only academical honours which his great merits procured for him. He was one of the earliest members of the American Philosophical Society; and in 1776, when a Royal Medical Society was instituted at Paris, Dr. Fothergill was one of a select number of foreign physicians, whom the society thought proper to rank among their associates.

Dr. Fothergill had very early acquired a taste for botany, which he indulged in proportion as the profits of his practice increased. For this purpose he purchased an estate at Upton, in Essex, containing, besides other lands, between five and six acres of garden-ground. In this place, at an expence seldom undertaken by an individual, and with an ardour that was visible in the whole of his conduct, he procured from all parts of the world a great number of the rarest plants, and protected them in the most ample buildings which this or any other country has seen. In a word, every plant that seemed likely to be useful in medicine or manufactures, or was admirable from its beauty or rarity, was to be found in his garden; and his suite of hot and green-house apartments, of nearly 260 feet in length, contained upwards of 3,400 species of exotics, and in the open ground were about 3000 other species of plants and shrubs. In compliment to his zeal and abilities the celebrated Linnæus distinguished a plant of the class Polyandria Digynia by the name of *Fothergilla*. But the exertions of Dr. Fothergill were not confined to botany; he studied the other departments of natural history, and patronized its ingenious cultivators. He had a very accurate knowledge of conchology, and possessed the best cabinet of shells in the kingdom, with the exception of that of the duchess of Portland; his collection of ores and minerals was distinguished for the rarity, rather than the number of the specimens that composed it; his cabinet of insects was extremely elegant, and it was from his collection of corals that the ingenious Mr. Ellis delineated his system. The great botanical work by Miller was begun and finished under the patronage of Dr. Fothergill, to whom it was with great propriety inscribed. But the dedication was afterwards cancelled, at his express solicitation; for although he took pleasure in encouraging ingenuity, he disliked to be told of it; and indeed he was averse to dedications in general, considering

fidering them as a fpecies of literary pageantry, more productive of envy to the patron, than of advantage to the author.

In the contefts between the fellows and licentiates of the College of Phyficians Dr. Fothergill took an active part, and fubfcribed five hundred pounds towards bringing it to a legal decifion. But he was not content with exerting his talents for the benefit of fcience and of his profeffion: his benevolence prompted him to many other labours. His obfervations on the fubjects of police, we are told, could they be collected together, would conftitute an ample and ufeful volume. (See Dr. Lettfom's Life of Dr. F.) He is faid to have written nearly an hundred letters in the Gazetteer on the fubject of the new pavement; and he was inceffantly communicating ufeful hints for the improvement of this great city. It was he who firft fuggefted the plan of bringing fifh by land carriage, in order to break a monopoly, which had highly enhanced the price of frefh fifh in all the markets about London. At the approach of the fevere winter of 1767, he propofed a fcheme, and liberally contributed to raife a fund for the purpofe, of purchafing fifh at a wholefale cheap price, and of difpofing of it at a fmall lofs, till the whole fubfcription fhould be expended. The fociety, who fupported the meafure, which was continued till 1770, in the fame manner purchafed potatoes in Lancafhire, and conveyed them by water to the metropolis. But the inftitution of the feminary at Ackworth, in Yorkfhire, of which he was the projector in 1778, and to which he was a liberal benefactor, both during his lifetime and by his will, was one of the moft important plans which his zeal to promote the welfare of fociety led him to undertake. Of his kindnefs and bounty to individuals it will be fufficient to mention one inftance, in the cafe of his worthy but unfortunate friend, the late Dr. Gowin Knight; who applied to Dr. Fothergill in a moment of pecuniary diftrefs, and returned with a heart fet at eafe by the noble benefaction of a *thoufand guineas*.

Finding his pleafant retreat at Upton too remote to be often vifited, while engaged in his profeffion, and yet too much within the fphere of action to be a refuge from care and importunity, Dr. Fothergill procured a leafe of Lea-Hall, near Middlewich in Chefhire, in the fummer of 1765, to which fecluded fpot he afterwards made an annual retreat as long as he lived; commonly leaving London in the month of July, and returning in the beginning of October. This retreat became the more neceffary, when, in 1767, he removed to Harpur ftreet, and enlarged the circle of his practice. For the greater part of his life he had enjoyed good health. But in November 1778, he was afflicted with a diforder, which he apprehended, though without foundation, to be an irregular gout: it terminated in a fuppreffion of urine, from which he recovered in about three weeks, and for the fpace of two years enjoyed his wonted degree of health. But the time was now approaching, when he was to experience that neither temperance nor medical fkill could exempt him from the final lot of humanity. On the 12th of December 1780, he was again feized with a fuppreffion of urine, which, notwithftanding every effort of the experienced phyficians and furgeon, who attended him, terminated his life on the 26th day of the fame month. On diffection the difeafe appeared to have been occafioned by a fcirrhous enlargement of the proftate gland, which compreffed the neck of the bladder, fo as to prevent the introduction of a catheter. His remains were depofited in the quakers' burial ground at Winchmore-hill, about twelve miles from London.

The perfon of Dr. Fothergill was of a delicate rather than an extenuated make. His features were all expreffive, and his eye had a peculiar brilliancy. His underftanding was comprehenfive and quick, and rarely embarraffed on the moft fudden occafions. There was a charm in his converfation and addrefs that conciliated the regard and confidence of all who employed him, and fo difcreet and uniform was his conduct, that he was not apt to forfeit the efteem which he had once acquired. At his meals he was uncommonly abftemious, eating fparingly, and rarely exceeding two glaffes of wine at dinner or fupper. By this uniform and fteady temperance, he preferved his mind vigorous and active, and his conftitution equal to all his engagements.

Dr. Fothergill's writings, with the exception of his inaugural thefis "De Emeticorum Ufu" (which is preferved in Smellie's "Thefaurus"), and his "Account of the putrid fore-throat," confift principally of papers printed in the Philofophical Tranfactions of the Royal Society, and in the "Medical Obfervations and Inquiries," a work of which fix volumes were publifhed, and which is known and highly efteemed wherever medical fcience is fuccefsfully cultivated. Befides the numerous effays in this excellent collection, to which the name of Dr. Fothergill is prefixed, we learn that he was the author of the three anonymous papers in the fourth volume, which conftitute the 8th, 10th, and 17th articles. He alfo publifhed feveral little effays, on the weather and reigning difeafes, on the Simarouba, and other fubjects, in the Gentleman's Magazine, and other periodical publications, which, however, were written in hafte and not publicly avowed. Thefe works have been collected and reprinted by Dr. Elliott, in 8vo. 1781, and by Dr. Lettfom in 4to in 1784. See Dr. Hird's affectionate tribute, &c. Dr. Elliott's Life of Dr. F.; Dr. Lettfom's Account of Dr. F.; and Dr. Thompfon's Life of Dr. Fothergill; alfo Lond. Med. Journal, vol. iv. p. 176.

FOTHERGILLA, in *Botany*, juftly ferves to commemorate the late John Fothergill, M.D. F.R.S. who, though not a writer on Botany, was eminently ufeful to the fcience, by introducing a great number of new plants, chiefly from the alps of Europe and from America, which he cultivated with fuccefs in his garden at Upton, and readily communicated to his friends.—Linn. Suppl. 42. Ait. Hort. Kew. v. 2. 241. Schreb. 922. Willd. Sp. Pl. v. 2. 1224. Mart. Mill. Dict. v. 2. Juff. 408. Clafs and order, *Polyandria Digynia*. Nat. Ord. *Amentaceæ*, Juff.

Gen. Ch. *Cal.* Perianth of one leaf, bell-fhaped, clofe, fhort, truncated, permanent. *Cor.* none. *Stam.* Filaments numerous, thread-fhaped, thickened upwards, much longer than the calyx; anthers minute, erect, quadrangular. *Pift.* Germens two, combined, ovate; ftyles two, awl-fhaped, terminal, the length of the ftamens; ftigmas fimple. *Peric.* Capfules rigid, each of one cell and two valves. *Seeds* folitary, bony.

Eff. Ch. Calyx inferior, truncated, entire. Corolla none. Germens combined. Capfules of two valves. Seeds folitary, bony.

1. F. *alnifolia*. Native of Carolina, and a hardy fhrub in the Englifh gardens. There are two varieties, one with blunt leaves figured in John Miller's Icones Plantarum; the other with acute ones, under the name of *F. Gardeni*, Jacq. Ic. Rar. t. 100.—The *leaves* are furnifhed with a few fhallow ferratures towards their ends, and are hoary beneath. The *flowers* appear chiefly in May, at the ends of the branches, in the form of white oblong fpikes or catkins of no great beauty.

FOTHERING, in *Sea Language*, is a peculiar method of endeavouring to ftop a leak in the bottom of a fhip while

while ſhe is afloat, either under ſail, or at anchor. It is uſually performed in the following manner: a baſket is filled with aſhes, cinders, and chopped rope-yarns, and looſely covered with a piece of canvas: to this is faſtened a long pole, by which it is plunged repeatedly in the water, as cloſe as poſſible to the place where the leak is conjectured to lie. The oakum or chopped rope-yarns, being thus gradually ſhaken through the twigs, or over the top of the baſket, are frequently ſucked into the hole along with the water, ſo that the leak is choaked, and the entrance of the water prevented. Falconer's Mar. Dict.

FOTHERINGHAY, in *Geography*, a pariſh in the hundred of Willybrook, and county of Northampton, eighty-five miles diſtant from London, connected as it has been with the lives and fates of princes, muſt ever be an intereſting ſpot to the topographer and traveller; as it doubtleſs will be conſpicuous to the lateſt period on the page of hiſtory. Here was formerly a caſtle, probably firſt erected in the time of the Conqueror by Simon St. Liz, ſecond earl of Northampton. It was rebuilt in the reign of Edward III. by Edward Langley, duke of York, who erected the keep in the ſhape of a fetterlock, the emblem or device of the family. By marriage this fortreſs became the property and occaſional reſidence of the Scottiſh kings. In the fourteenth year of king John's reign, David king of Scotland was ſummoned to ſurrender it; and refuſing compliance, the ſheriff was directed by royal mandate to raiſe the poſſe comitatus, and compel him to ſubmiſſion. Edward IV. made this fortreſs his reſidence in the twenty-ſecond year of his reign; when Alexander, king of Scotland, had an audience, and promiſed to do homage and fealty to the crown of England. In the reign of Elizabeth the cuſtody of this caſtle was confided to ſir William Fitzwilliams, at which period it was rendered a ſcene of woe, at the mere idea of which humanity ſhudders, and the mind ſtarts back with horror from the ſanguinary tranſaction. Here Mary Stewart, queen of Scots, was long impriſoned, then tried, condemned, and executed, in the year 1580. Reſpecting the juſtice or injuſtice of the melancholy event much has been written; and while the ingenious Buchanan has uſed all his efforts to detect, and poured forth all his eloquence to emblazon the queen's guilt; a no leſs able writer, Whitaker, has wielded the energies of his genius, and the weapons of his learning, to eſtabliſh her innocence, and demonſtrate her proſecutor's guilt. Camden, who was a cotemporary, and poſſeſſed ample means of arriving at the truth, endeavours to avoid entering into any diſcuſſion upon the point; obſerving, "Let it ever be forgotten if poſſible, but if not, let it ever be wrapped up in ſilence." Fotheringhay, however, notwithſtanding the reſerve of ſome, and the miſrepreſentation of others, notwithſtanding the caſtle is demoliſhed, the walls of the unfortunate princeſs's priſon down, and the hall of judgment no more, will tranſmit the deplorable fact to the lateſt poſterity; and record in its name and ſcite the nefarious tranſaction. The caſtle, from a manuſcript account, and the deſcription given of it by Leland, muſt have been a noble ſtructure, containing numerous apartments, ſecured by ſtrongly fortified walls, with double ditches moated round. But on the acceſſion of James to the crown of England, an order was iſſued for its complete demolition; and nothing at preſent remains except the ſcite, marked out by the moat and part of the agger on which the keep was erected.

At ſome remote period a nunnery had been founded here, on the ſcite of which Edward Langley, duke of York, erected and endowed a ſecular college for a maſter, twelve chaplains, eighteen clerks, and thirteen choriſters; the annual revenues of which, at the diſſolution, amounted, according to Speed, to 489*l.* 15*s.* 9*d.* The conventual is the preſent pariſh church, in which were interred Edward, duke of York, who was ſlain at the battle of Agincourt, in the third year of Henry V.; and Richard Plantagenet, duke of York, who was ſlain at Wakefield, while attempting to obtain acceſſion to the throne on the death of Henry VI. Their ſumptuous monuments having been deſtroyed, two of indifferent workmanſhip were erected at the command of queen Elizabeth: by whoſe munificence alſo a grammar ſchool was erected and endowed.

This village, ſo diſtinguiſhed in hiſtory, was formerly a conſiderable town, and had a weekly market on Wedneſdays, and three annual fairs. At preſent it conſiſts of one ſtreet, containing only 46 houſes and 307 inhabitants.

This was the birth-place of Richard Plantagenet, duke of Glouceſter, afterwards king Richard III.; in whoſe perſon, Fuller obſerves, "Ajax and Ulyſſes met; poſſeſſing eloquence to talk, and valour to fight." He was deformed in body, and by the generality of hiſtorians he has been repreſented as ſtill more deformed in mind. Had he not waded to the throne through the blood of his nephews, Edward V., and Richard, duke of York, whom he is ſaid to have cauſed ſecretly to be murdered in the Tower; he might have appeared to deſerve it; for his ſhort reign was diſtinguiſhed by the enactment of ſeveral excellent laws, and he was not deficient in perſonal courage. Having met Henry, duke of Richmond, who had aſſembled an army againſt him, in Boſworth field, after performing prodigies of valour, the king there loſt both his crown and his life. See Camden's Britannia, and the Beauties of England and Wales.

FOTIPET, a town of Hindooſtan, in Bednore; 5 miles E.N E. of Bednore.

FOTOQUE, in the *Japaneſe Theology*, the name of an order of deities; the other order being called Camis. From the latter they obtain the bleſſings of this life, and from the former thoſe which relate to a future life.

FOTUS, in *Medicine*, the ſame as fomentation.

FOU, in *Geography*, a town of China, of the ſecond rank, in the province of Chan-ſi; 420 miles S.W. of Peking. N. lat. 26° 5′. E. long. 108° 44′.

FOU-AN, a town of the kingdom of Corea; 35 miles W.N.W. of Cou-fou.

FOUCAULT, Nicholas-Joseph, in *Biography*, was ſon of a ſecretary to the council of ſtate, and was born at Paris in 1643. He was educated for the French bar, at which he afterwards obtained much celebrity, and paſſed through various offices till he became a maſter of requeſts, and chief of the council of madame, ducheſs of Orleans. At the revocation of the edict of Nantes, he exerciſed ſuch prudence in the diſtrict over which he was the intendant, that much of the miſchief was prevented which that arbitrary meaſure was calculated to produce. So grateful are the people, in almoſt all caſes, for favours done them, that in this inſtance a medal was ſtruck in gratitude for the liberality exhibited by Foucault. At the different places in which he ſuſtained any public office, he encouraged the arts and local eſtabliſhments and improvements calculated to benefit the trade of the country. He was the firſt to ſet on foot the conſtruction of new roads, canals, havens, and bridges; and to ſanction, with all his influence, inſtitutions for the promotion of the uſeful arts and ſciences. His own valuable library and cabinet were ever open to thoſe who were able to uſe them. He added much to the ſtock of antiquarian knowledge, by the diſcovery which he made in 1704,

1704, of the ancient town of the Viducaffians, near Caen, of which he laid a particular account before the "Academy of Infcriptions." He alfo difcovered a MS. "De Mortibus Perfecutorum," which is generally attributed to Lactantius. Moreri.

FOU-CHAN, in *Geography*, a town of China, of the third rank, in the province of Chang-tong; 25 miles S.E. of Tang-tcheou.

FOUCHENDGE, or Foushengf, a town of Perfia, in the province of Chorafan, taken and plundered in 1380 by Timur Bey, though ftrongly fortified, 25 miles N. of Herat. N. lat. 34° 50′ E. long. 76° 29′.

FOUCHER, Simon, in *Biography*, a writer of fome celebrity, was born at Dijon in the year 1644, where he was educated, afterwards ordained prieft, and prefented to an honorary canonry. That he might purfue philofophical ftudies, to which he was extremely attached, with more freedom and advantage, he removed to Paris, where he acquired the efteem and friendfhip of many eminent men of the time; but he formed his moft intimate connection with thofe who diftinguifhed themfelves as advocates for the revival of the academic philofophy. In the propagation of their fyftem he was extremely zealous, and devoted his pen with confiderable learning in defence of them. He is mentioned by Baillet in terms of high refpect, who even denominates him "the reftorer of the academic philofophy:" and the editors of the "Menagiana" have afferted that Menage thought Foucher and Huet were better acquainted with the different fects of philofophers than any of their contemporaries. M. Foucher died at Paris in his fifty-third year, and it was fuppofed his intenfe application to ftudy had a great effect in fhortening his days. He was author of a variety of "Differtations," "Criticifms," "Letters," &c. which form a collection of fix volumes: alfo of "A Treatife on the Wifdom of the Ancients," publifhed in one vol. 12mo., intended to fhew that the principal maxims of their morality are not contrary to the principles enforced by the Chriftian code: and "A Letter concerning the Morality of Confucius;" and "A Treatife on Hygrometers, or Inftruments for afcertaining the drynefs and humidity of the Air." Moreri.

FOUCHS, Johann, Joseph, a native of Stiria, a province of Germany, in the circle of Auftria. He appears as an author in 1707, when he publifhed at Nuremberg a work entitled "Concentum Mufico-inftrumentale, in 7 partitas divifum:" and he alfo compofed an opera, called Eliza, for the birth-day of the emprefs Elizabeth Chriftina, which was printed at Amfterdam by Le Cane. Soon after this he was appointed firft maeftro di cappella to the emperor; but he is beft known as a learned writer on mufic by his "Gradus ad Parnaffum five manuductio ad compofitionem muficæ regularem, methodo novo, ac certa nondum ante tam exacto ordine in lucem edita," written in Latin, and publifhed in 1725. It is dedicated to the emperor Charles VI., who defrayed the whole expence of the publication. The work is printed in folio, and divided into two books: the firft is entirely theoretical, and rather a treatife on harmonics than practical counterpoint: we have here all the ratios and proportions of mufical intervals, and the arithmetical, harmonical, and geometrical divifions of the monochord, which may be found in almoft all elementary books on mufic during the two laft centuries.

The fecond book is in dialogue, between a mafter and fcholar; in which examples are given in notation of the moft fimple plain counterpoint, from two to four parts. Then examples of florid counterpoint, and of ligatures or binding notes. After this, the author treats of fugue in 2, 3, and 4 parts. Then of double counterpoint; and laftly, of variations, modes of the church, various fubjects of fugue, of tafte, of the ecclefiaftical ftyle, a cappella, of the mixed ftyle, and of recitative. The doctrine in this work is very orthodox, containing no licences, or any thing to which the fathers of the fcience would object. The leffons are almoft all on canto firmo, after the manner of the Neapolitan fchool.

In 1742 this excellent work was tranflated into German by Mizlar, and publifhed at Leipfic, 4to. with notes. The letter-prefs of this edition is well printed; but the plates are engraved in too fmall a character, and much crowded and confufed. In 1761 it was tranflated into Italian, and publifhed in folio by Manfredi in Carpi. To this verfion is prefixed a recommendatory letter by the celebrated Piccini, in which, with national partiality, and the flippancy of a young man, he compliments the author, Fouchs, by faying that he was "a German with an Italian underftanding." Haydn had not then furpaffed all the Italian compofers of *inftrumental mufic* in fcience and invention; nor had the premature genius of Mozart expanded in marvellous mafterpieces of compofition, both vocal and inftrumental. Some detached parts of the "Gradus ad Parnaffum" were publifhed in England by Welcher about the year 1770, tranflated by Hoeck; but the entire work has never appeared in our language. The venerable imperial maeftro di cappella lived to a great age. Quantz tells us (in his own life, written by himfelf) that in the year 1723, he, with Weis, the famous lutenift, and Grann, the opera compofer, went to Prague, where moft of the great muficians of Europe were affembled by order of the emperor Charles VI. to celebrate the feftival of his being crowned king of Bohemia. Hiftory does not furnifh a more glorious event for mufic than this folemnity, nor a fimilar inftance of fo great a number of eminent profeffors, of any one art, being collected together.

Upon this occafion, there was an opera performed in the open air, by a hundred voices, and by two hundred inftruments. There was not an indifferent finger among the principal performers, all were of the firft clafs. The male parts were filled by Orfini, Domenico, Careftini, Gaffati, Corofini, and Braun, a German *baritono*; the female, by the two fifters, Amberville, one of whom was afterwards married to Peroni, a famous player on the violoncello, and the other to Boroffini, the finger.

The opera was called "La Conftanza e Fortezza," and compofed by the famous old Fux, imperial chapel-mafter at Vienna. The mufic, which was in the old church ftyle, was coarfe and dry; but, at the fame time, grand, and had a better effect, perhaps, with fo immenfe a band, and in fuch an immenfe fpace, than could have been produced by more delicate compofitions.

FOUCHUN, in *Geography*, a town of China, of the third rank, in the province of Se-tchuen; 30 miles N.W. of Tche-li-leou.

FOUCQUET, Nicholas, marquis of Belleifle, in *Biography*, fon of Francis Foucquet, vifcount de Vaux, and a counfellor of ftate, was born in 1615, and brought forwards very early in the departments of law. He was created procureur-general of the parliament of Paris at the early age of thirty-five. By cardinal Mazarin he was made fuperintendant of the finances, and participated largely in the public plunder, which was carried to an enormous height during the cardinal's adminiftration. Foucquet is faid to have fpent more than half a million fterling upon his feat of Vaux, where he gave the moft magnificent entertainments. He was a liberal patron of men of letters, and acquired

quired many friends among them who did not desert him after his disgrace. Foucquet offended the king by attempting to gain the heart of mad. de la Valiere, and he was arrested at Nantes in September 1661. He was committed to prison, and a commission was appointed to try him on various charges, but he defended himself so well, and repelled the attacks of the lawyers so dexterously, that it was full three years before the decision and sentence against him could be pronounced. He was condemned to banishment, which was exchanged for perpetual imprisonment in the citadel of Pignoral. Of the multitudes who had been benefited by his liberality, scarcely any remained faithful to him in his adversity, except some of his literary pensioners. Among these were mademoiselle de Scuderi, La Fontaine, and Pelisson, by the last of whom he was defended in several eloquent memoirs. He bore his change of fortune with firmness, and employed his solitary hours in the composition of various works of piety. He died March 23, 1680, aged 65 years. Moreri.

FOVEA Cordis, the pit of the heart, or rather of the stomach, called also *scrobiculus cordis.*

FOUESNANT, in *Geography*, a town of France, in the department of Finisterre, and chief place of a canton in the district of Quimper; 7 miles S. of Quimper. The town contains 1858, and the canton 5535 inhabitants, on a territory of 155 kiliometres, in 6 communes.

FOU-FONG, a town of China, of the third rank, in the province of Quang-tong; 22 miles E.S.E. of Fong-tsiang.

FOUG, a town of France, in the department of the Meurte; 4 miles W. of Toul.

FOUGATE, Fougasse, or *Fougades*, in the *Art of War*, a little mine, in manner of a well, seldom exceeding ten feet in width, and twelve in depth: dug under some work or post that is likely to be lost; and charged with barrels or sacks of gun-powder, covered with earth. It is frequently placed before the weakest parts of a fortification, as the saliant angles and faces, not defended by a cross-fire, and is set on fire like other mines, with a faucisse.

The word is French. M. Huet derives it from *focato*, or *focus, fire.*

FOUGERAI, in *Geography*, a town of France, in the department of the Ille and Vilaine, and chief place of a canton in the district of Rédon; 13 miles E. of Rédon. The town contains 4193, and the canton 4802 inhabitants, on a territory of 120 kiliometres, in 2 communes.

FOUGERES, a town of France, and principal place of a district, in the department of the Ille and Vilaine, containing in its two divisions about 7297 inhabitants, whose chief trade is in leather. The first division contains 3648, and its canton 12,665 inhabitants, on an extent of 165 kiliometres, in 10 communes; and the second division contains 3649, and its canton 14,063 inhabitants, on a territory of $177\frac{1}{2}$ kiliometres, in 9 communes. It is seated on the rivulet Nanson, that falls into the Coesnon, 8 leagues N.E. of Rennes, and 9 S.S.E. of Avranches. It has an abbey and old castle, and was formerly reputed a place of some strength; and is still noted for its four annual fairs.

FOUGHT, in *Biography*, a native of Lapland, who, nearly fifty years ago, came to London, and obtained a patent for the sole printing of music, with letter-press types of his own founding, which were very neat, and the first that were used in London. He opened a shop in St. Martin's lane, and published several sets of lessons and sonatas; but by a combination of music-sellers in London, who copied his publications on stamped plates, and undersold him, he was driven out of the kingdom.

Musical types are now very common: but by being long accustomed to stamped notes in pewter plates, the public eye is not pleased with them. The best use to which they are now put is in printing books on the subject of music, where they save the trouble of working small plates of single passages, and examples in notation, into the letter-press.

FOUIN, in *Geography*, a country of Africa, N. of Ardra.

FOU-KEOU, a town of China, of the third rank, in the province of Honan; 30 miles E.N E of Hiu.

FOU-KIANG, a town of China, of the third rank, in the province of Quang-tong; 20 miles W.N.W. of Tsin.

FOU-KO, a town of China, of the third rank, in the province of Quang-tong; 65 miles N.N.E. of Kia.

FOUL, in the *Sea Language*, is used when a ship has been long untrimmed, so that grass, weeds, periwinkles, barnacles, or the like, stick or grow to her sides under water. In this state she is said to be foul.

A ship is said to make *foul water*, when, being under sail, she comes into such shoal, or low water, that though her keel doth not touch the ground, yet she comes so near it, that the motion of the water under her raises the mud from the bottom, and so fouls the water.

Foul is also a sea term, importing the running of one ship against another. This happens sometimes by the ungovernable violence of the wind, and sometimes by the carelessness of the people on board; and sometimes happens to ships of the same convoy; sometimes to such as meet accidentally; and sometimes to such as are in port, by means of others coming in. The damages occasioned by running foul, are of the nature of those in which both parties must bear a part; they are usually made half to fall upon the sufferer, and half upon the vessel which did the injury; but in cases where it is evidently the fault of the master of the vessel, he alone is to bear the damage.

Foul *Ground*, of a road, bay, sea-coast, or harbour, signifies that which is rocky, or abounding with shallows, or otherwise dangerous.

Foul *Hause*, denotes that the cables are turned round each other, by the winding or turning about of a ship while she rides at anchor.

Foul *Wind*, expresses that which is unfavourable, or contrary to the course of the ship, in opposition to large or fair.

Foul *Feeding*, in the *Manege*, denotes a voracious appetite, to which some horses are subject, which, though not properly a disease, is the cause of various maladies. It is commonly the effect of some latent distemper, and frequently occasioned by worms irritating the intestines.

Foul feeders will leave their hay to eat their litter, even when it is soaked with their dung and urine, and discover a vitiated as well as a voracious appetite. The best remedy in cases of this kind is to begin with purging, and to dissolve chalk in their water, and afterwards to give them good exercise. The following draught will also serve to blunt their appetites; take a large handful of the roots of marshmallows; cummin seeds, and fenugreek seeds, of each an ounce; liquorice roots sliced, half an ounce; boil them

in three pints of water, till the roots are soft and slimy; then pour off the decoction, and dissolve in it an ounce of gum arabic, and add four ounces of linseed oil. Let the horse have four handfuls of this mixture every morning fasting, till his appetite abates. Care should also be taken to keep the stalls as clean as possible. Gibson's Farriery.

Foul *Bay*, in *Geography*, a bay on the N. E. coast of the island of Barbadoes.—Also, a bay on the S. coast, near the eastern extremity of the island of Jamaica. N. lat. 17° 54'. W. long. 75° 56'.—Also, a bay on the S. coast of the island of Java. S. lat. 8° 38'. E. long. 113° 45'.

Foul *Island*, a small island in the Chinese sea, near the coast of Cochinchina. N. lat. 11° 37'. E. long. 108° 53'.—Also, a small island in the bay of Bengal, near the coast of Ava. N. lat. 18° 12'. E. long. 94° 11'.

Foul *Islands*, a cluster of small islands in the East Indian sea, near the N. coast of the island of Flores. S. lat. 8° 9'. E. long. 121° 22'.

Foul *Point*, a cape on the E. coast of Madagascar. S. lat. 17° 40'. E. long. 49° 50'. This cape is called by the natives "Voolou-voolou;" and is the place most frequented by Europeans. The entrance of the port lies in a northern direction; the breadth of the passage is about 50 fathoms, and it is nearly of the same depth; it will hold 10 large ships, which may be moored all in a line. The riding is safe, but between the months of October and June the entrance is sometimes obstructed and shut up by a bank of quicksand, which disappears as soon as the S. E. winds succeed the northern gales and calms. The harbour is formed by coral rocks, which run N.N.E.; and upon these are various sea-plants, mosses, black corals, madrepores, starwort, sea-insects, and shells, which, by the multiplicity of their form, and the brilliancy of their colours, serve to decorate the cabinets of the curious. The mouth of the river presents large beds of delicate and palatable oysters of peculiar configuration. Ships may be supplied with all sorts of provisions, which are various and abundant. The villages inhabited by the tribe of "Voolou-voolou" are not very considerable; they are fortified with palisades; most of them are erected upon the declivity of hills, and they are delightfully shaded by a great number of useful trees. The district of "Voolou-voolou" contains excellent pasture grounds, and a great number of cattle. The river Onglebey, which suddenly loses itself in the sands at the distance of 400 fathoms from its mouth, abounds with fish and aquatic birds; and canoes row up to a distance of more than 20 leagues. It is, however, infested with a great number of monstrous crocodiles, which find a secure retreat among the trees that cover its banks.

Foul *Sound*, a strait or passage on the west of Ireland. It is between Inismain and Innishere, two of the south isles of Arran, which lie at the entrance of Galway bay. Besides a great rock, there is an extensive shoal, which renders this not a good passage.

FOULA, one of the Shetland islands, which is narrow, high, and rocky, about three miles in length, and affords some pasture. Its inhabitants, in number about 150, are almost in a state of nature. It has one indifferent landing place. On the W. coast are hideous precipices. It is upwards of seven leagues W.S.W. from the broadest part of the Main-land. Some writers have supposed this island to be the "Ultima Thule" of Tacitus and the ancients. N. lat. 60° 6'. W. long. 2° 17'.

FOULAH, Fouli, or Pholey, a country of Africa, bordering on the river Senegal, and extending about 480 miles from east to west; the boundaries from north to south being unknown. This country is populous, and the soil fertile, and capable of furnishing an advantageous commerce, if the inhabitants were industrious. Their complexion is generally tawny, though many of them are black; and it is supposed that they derive their mixed colour, between the true olive and black, from their alliances with the Moors. Although they are remiss in availing themselves of the advantages of commerce, they are diligent as farmers and graziers; and raise millet, rice, tobacco, cotton, pease, roots, and fruits in abundance; nor are they less expert in rearing cattle, which is the staple of their traffic with neighbouring countries. Their cattle constitute their chief wealth, and accordingly they roam, pursuing a kind of wandering life, from field to field, and from country to country, with large droves of cows, sheep, goats, and horses; removing, as the wet and dry seasons require, from the low to the high lands, and continuing no longer in one place than the pasture for their cattle will allow. The inconvenience and labour of this roving life are augmented by the defence they are obliged to provide against the depredations of the fierce animals with which the country abounds; as they are molested by lions, tigers, and elephants from the land, and crocodiles from the rivers. At night they collect their herds and flocks within a circle of huts and tents in which they live, and where they light fires in order to deter these animals from approaching them. The king of the country, called Siratic, though commonly destitute of the badges of majesty, possesses great authority among his subjects, and is as much respected by his neighbours as any one on the coast. The crown descends, not from father to son, but from brother to brother, and nephew to nephew. The Foulahs are celebrated by travellers as a people extremely hospitable; all persons, whatever be the country to which they belong, being freely admitted into their huts, and treated with the best accommodation they can afford; nor is their humanity less worthy of notice than their hospitality, for as soon as any one of them has the misfortune to fall into slavery, all the rest join their stock to redeem him. Their arms consist of bows and arrows, lances, swords, daggers, and occasionally a kind of small fusee; all which they use with a singular dexterity, especially in hunting, which is a diversion to which they are much attached. The game they pursue consists of elephants, lions, tigers, and the fiercest animals. The teeth of elephants, the skins of lions, leopards, and tigers are sold by them, and the flesh is dried and smoked for use and for winter store. The elephants are so numerous, that they appear in droves of 200 together, plucking up the small trees, and destroying whole fields of corn; so that they have recourse to hunting, not merely as a pastime, but as the means of self-preservation.

FOULDAGE. See Faldage.

FOULNESS, in *Geography*, an island with a church village, separated by a narrow channel, or arm of the German ocean, from the main land of England, and S.E. part of the county of Essex, about 12 miles in circumference, 6 miles E. of Rochford.

Foulness *of Colours*, in *Painting*, is used in opposition to brightness, and denotes a defect of purity. It is sometimes called *breaking* the colour.

FOULON, or Foullon, John Erard, in *Biography*, was born at Liege, of an ancient and distinguished family, in the year 1609: and in 1625 he entered the order of the Jesuits. He had an excellent understanding, and capable of grasping every branch of science. His tutors observing that his qualifications were peculiarly adapted to the duties of a preacher, took care to instruct him in the requisites for undertaking the office, and he became celebrated for his

his public ſervices for more than thirty years. He was ſucceſſively appointed rector of the colleges at Huy and Tournay, and died in the latter city in 1668; his death was occaſioned by a peſtilential diſorder which he took by attending on the ſick and the dying. He is known as an author by many theological pieces; by "Commentarii Hiſtorici et Morales ad libros I. and II. Machabæorum, additis liberioribus E curſibus," in two vols. folio. Alſo by "Hiſtoria Leodienſis, per Epiſcoporum et Principum Seriem digeſta ab origine populi uſque ad Ferdinandi Bavari Tempora," &c. in 3 vols. folio. This work, though not very ably executed, is ſaid to throw much light on the hiſtory of the Low Countries. Moreri.

FOULOU-SOUSOU, in *Geography*, a town of Chineſe Tartary, on the Saghalien; 9 miles N.W. of Telden.

FOULWEATHER, Cape, a cape on the W. coaſt of North America. N. lat. 44° 42′. W. long. 124° 7′.

FOULWIND, Cape, a cape on the N.W. coaſt of Tavai Pœnammoo. S. lat. 41° 55′. W. long. 187° 51′.

FOUMART, a name uſed in ſame parts of England for the pole-cat. See Mustela *Putorius*.

FOU-MING, in *Geography*, a town of China, of the third rank, in the province of Yun-nan; 15 miles N.N.W. of Yun-nan.

FOUNDATION, in *Architecture*, denotes the trenches or excavations dug in the earth by taking away the looſe or ſoft ground, and reducing it to an uniform texture and firm bottom ſo as to reſt an edifice or building with ſecurity, and to prevent fractures after erection.

The ſpecies of ground on which a building may be conſtructed are gravel, ſand, and clay. Gravel is an excellent dry bottom where there are no ſprings. Sand is alſo a very good bottom for houſe-building; but care ſhould be taken to make the foundation ſufficiently deep, and not to make any excavation near it, nor below the level of the bottom, particularly after the erection of the edifice; as ſand partakes in ſome degree of the property of water, a very ſmall force being ſufficient to diſplace the particles, and make them deſcend to the loweſt place; its own gravity is even ſufficient for this purpoſe. Sand is altogether unfit for water-works, without other preparations. Almoſt the whole of the city of Glaſgow is built upon ſand; moſt of the houſes in the principal ſtreet are four ſtories in height, and many of them five. Clay is a firm bed for building, but it is apt to throw damps upwards into the wall. Rock is alſo an excellent bed for the foundation of a building, when it can be eaſily obtained, either by being on the ſurface, or by digging to a depth, ſo as not to occaſion a very conſiderable outlay. It will frequently be a conſiderable ſaving in the conſtruction of the building.

There are many ſituations, however, on which there are occaſions to erect edifices where neither rock nor ground can be found that may be depended on. In order to aſcertain the degree of hardneſs, a lever may be ſo conſtructed as to be moveable round a pin at one end, firmly fixed to an upright ſtandard, and graduated from the centre of motion in the manner of a ſteel-yard, and another ſtandard or upright piece, with a flat bottom fixed at a given diſtance from the fulcrum, with a moveable joint where it connects with the horizontal lever; then a conſtant weight being appended to the arm, and ſlid to and fro until the upright piece with the flat bottom be preſſed into the ground, the diviſion on which the weight falls will ſhew the comparative degree of denſity. The depth to which a foundation ought to be dug might be aſcertained by boring, or by an iron crow.

Palladio ſays that the foundation ought to be one-ſixth of the height of the edifice; but this aſſertion is vague, as a building might reſt as firmly on the ſurface of the ground, as if excavated to any depth, provided that the ſoil is alike ſufficient in both caſes.

If nothing but mud can be obtained, then an artificial bottom muſt be conſtructed of piles and planking. The proportion of the piles may be ſuch that their thickneſs may be one-twelfth part of their length. Their diſtances, and the depth to which they are driven, will depend on the nature of the ſoil; they are ſometimes placed ſo rank as to leave no interſtice; their diſtance ought never to exceed the breadth of the ſtones which are to be laid on them. Tranſverſe pieces of wood, called ſleepers, are faſtened to the tops of the piles, which are levelled for the purpoſe, and then planked over.

In ſome caſes, where the ſoil is not very bad, two or more horizontal rows of timbers are introduced under the ſtone work, and well faſtened at the angles. This is a good precaution where the maſonry is to be carried up upon narrow piers. Should the ſoil be found firm, except in a few places, which might require to be dug to an immenſe depth, throw arches over the infirm places, obſerving to make the abutments ſufficient.

Forced earth is unfit for a foundation for a conſiderable time.

Foundation is alſo uſed to expreſs the bottom of a wall, conſtructed of greater breadth than the ſuperincumbent parts, in order to reſt the edifice firmly and uniformly, and prevent ſettlements by its greater breadth occaſioning a greater difficulty in penetrating the ground.

The foundation generally conſiſts of one, two, or more courſes, the ſuperior always leſs in breadth than the inferior, and the ſuperior greater than the breadth of the inſiſting wall, with the middle of the courſes, and the middle of the wall ſo regulated as to fall vertically over each other.

The different breadths, from the bottom of the wall to the bed of the building, exceed each other equally in ſucceſſion, and conſequently the projections are alike on both ſides, and to each other. Each courſe which forms the foundation is called a footing, and each projection is called an offset or ſet-off.

The breadth of the foundation, it is evident, muſt always be proportioned to the weight of the ſuperſtructure, and the ſoftneſs of the ground on which it is laid. If the texture of the ground is uniform, and if a wall only is to be erected, the breadth of the foundation will be as the area of the vertical ſection of the wall taken at right angles to the face. Therefore, if the wall is equally thick, the breadth of the foundation will be in the compound ratio of the breadth and height of the inſiſting wall. Thus for example, let a wall 40 feet high and two feet thick have a ſufficient foundation of three feet in thickneſs, what muſt be the breadth of the foundation of a wall 50 feet in height, and $2\frac{1}{4}$ thick upon the like bed of earth; then $2 \times 40 : 2\frac{1}{2} \times 50 :: 3 : 4\frac{11}{16} =$ the anſwer. Again, let us ſuppoſe the bed of the building to vary in texture, and let us ſuppoſe that the former is three degrees of ſoftneſs, and the latter five; in this caſe the breadth of the bottom footing will be in the compound ratio of the height of the wall, its breadth and the degree of ſoftneſs of the ground, the reſt of the data being as in the former example; then $2 \times 40 \times 3 : 2\frac{1}{2} \times 50 \times 5 :: 3 : 7\frac{195}{240} =$ the anſwer. Though a wall is here only ſpoken of, yet the ſame operation will apply to the maſs of the whole fabric, provided that the weight can be aſcertained.

The reader may think the circumſtance rather ſingular, that the foundation of a wall may be thinner than that of the

the fuperftructure, but that this may often happen may be eafily fhewn, fince it is the weight only that is in queftion, and not the magnitude; thus fuppofe that a foundation, three feet thick, is fufficient for a wall two feet thick, and 40 feet high; the very fame thicknefs of foundation is equally capable of fupporting a wall four feet thick, and 20 feet high, becaufe the infifting weights are alike in both cafes. Therefore the above calculation, leaving out the degree of foftnefs of ground, will give the breadth of the foundation of the required wall, equal to the breadth of the infifting wall itfelf, when the height of the required wall happens to be equal to the height of the required wall, multiplied by its breadth, and divided by its thicknefs; fuch would be the cafe in a wall of $26\frac{2}{3}$ feet in height; for $\frac{2 \times 40}{3} = 26\frac{2}{3}$. It is evident, if the height of the wall be lefs than $26\frac{2}{3}$ feet, that the breadth of the foundation will be lefs than that of the wall itfelf. Although this is the cafe with refpect to the rule, of the principle of which there can be no doubt; yet if the wall itfelf is conftructed according to reafon, that is, to proportionate its thicknefs to its height, the fame thing will not obtain; it is only a prepofterous thicknefs that occafions the fingularity of the circumftance. The rule only gives the perpendicular preffure, and fuppofe the thicknefs were out of all proportion to the height, it would not be advifable in any cafe to make the footing lefs than the infifting part of the wall, as it would not be fo able to refift the preffure of heavy winds.

Other obfervations will be found under the article Wall.

Foundation is alfo ufed figuratively for the eftablifhment of a city, empire, or the like.

The Romans reckoned their years from the foundation of Rome, *ab urbe condita*; which we fometimes exprefs by *ab U. C.* Chronologers make 745 years from the Ifraelites paffing out of Egypt, to the foundation of Rome.

Foundation alfo denotes a donation, or legacy, either in money, or lands, for the maintenance and fupport of fome community, hofpital, fchool, lecture, or other work of piety.

Among the order of Auguftines, there is a foundation for the marrying of poor maids; and another for the furnifhing of truffes to poor people who have ruptures, or hernias.

The founding and building of a college or hofpital, is called *foundatio*, *quafi fundatio*, or *fundamenti locatio*. Co. Lit. 10. The king only can found a college; but there may be a college in reputation founded by others. Dyer, 267. See Founder.

FOUNDAY, in *Metallurgy*, a term ufed by the workers at the iron mines, in many counties of England, for the fpace of fix days, in which time they contrive to make a determinate quantity of iron, fo that they count their work by thefe foundays or weeks.

FOUNDER, he who lays a foundation, or who founds and endows a church, fchool, religious houfe, or other work of charity and piety.

The founders of churches may preferve to themfelves the right of patronage, or prefentation to the living. The founder of all corporations, in the ftricteft and original fenfe, is the king alone, for he only can incorporate a fociety; and in civil incorporations, fuch as mayor and commonalty, &c. where there are no poffeffions or endowments given to the body, there is no other founder but the king; but in eleemofynary foundations, fuch as colleges and hofpitals, where there is an endowment of lands, the law diftinguifhes, and makes two fpecies of foundation; the one *fundatio incipiens*, or the incorporation, in which fenfe the king is the general founder of all colleges and hofpitals; the other *fundatio perficiens*, or the dotation of it; in which fenfe the firft gift of the revenues is the foundation, and he who gives them is in law the founder; and it is in this laft fenfe that we generally call a man the founder of a college or hofpital (10 Rep. 33.); but if the king and a private perfon join in endowing an eleemofynary foundation, the king alone fhall be the founder of it. If it cannot appear by inquifition, who was the perfon that founded a church or college, it fhall be intended it was the king; who has power to found a new church, &c. Moor 282.

Founder is alfo an artift that melts or cafts metals into various forms, for divers ufes; as guns, bells, ftatues, bombs, types or printing characters; and other fmall works, as candlefticks, buckles, &c.

The word in this fenfe is formed of the French *fondre*, to melt or fufe. In the Roman law they are called *ftatuarii*.

From the different productions, or works of the founders, they are differently denominated, as founders of fmall works; bell-founders; gun-founders; letter-founders; figure cafters, &c. What belongs to each, fee under Foundery.

Founder, in *Glafs-making*, is a term appropriated to the green-glafs houfes, and is the perfon there, who in the fame office in the white-glafs-making is called the *conciator*.

Founder's *Furnace*. See Furnace.

Founders, *Moulds of*. See Moulds.

Founders's *Prefs*. See Press.

Founder, in the *Sea Language*. A fhip is faid to founder at fea, when by an extraordinary leak, or a great fea breaking in upon her, fhe is fo filled with water, that fhe cannot be freed of it, nor is able to fwim under it, but finks with the weight thereof.

FOUNDERING, in the *Manege*, a diforder in horfes, whereof there are two kinds, *viz.* in the feet, and in the cheft.

Foundering *in the Feet*, arifes from hard riding, fevere labour, great heats, fudden colds, &c. which inflame the blood, and, as the farriers term it, melt the greafe, and make it defcend downward to the feet, and there fettle; which caufes fuch a numbnefs and pricking in the hoof, that the horfe has no fenfe of feeling in it, being hardly able to ftand; or, when he does, fhaking and trembling as if he had an ague.

A horfe may likewife be foundered by wearing ftraight fhoes, and by travelling upon hard ground.

It may be known when he is foundered on his fore-feet, and not his hind-feet, by his treading firmly on his hind-feet, and fparing the other; or his going crouching or crippling on his buttocks.

Sometimes, though rarely, he is foundered in his hind feet, and not his fore; which is known by his feeming weak behind; and refting, as much as poffible, on the fore-feet.

The general methods of curing this diftemper are, firft by paring all the horfe's foles fo thin, that the quick may be feen; then bleeding him well at the toes; ftopping the vein with tallow and refin; and then having tacked hollow fhoes on his feet, ftopping them with bran, tar, and tallow, as boiling hot as may be; which is to be renewed once in two days, for a week together; after which he is to have good exercife.

Or, after he is pared thin, and let blood at the toes, his feet are to be ftopped with cows' dung, kitchen-fee, tar,

and foot, boiled together, and poured, boiling hot, into them.

Foundering *in the cheft or body*, ufually befals a horfe by eating too much provender fuddenly, when too hot; as alfo by drinking too much upon travelling, when he is hot, and riding him after it; and it denotes a chronic inflammation of thofe parts in a horfe which are fituated immediately external to the pleura. Accordingly this difeafe, confifting in an inflammation of the intercoftal mufcles, which compofe the flefhy parts between the ribs, is called by Gibfon "external pleurify." It is known by a ftiffnefs of the body, fhoulders, and fore-legs, fometimes attended with a fhort dry cough in the beginning, and a fhrinking when a horfe happens to be handled in thofe parts.

While recent, it is to be treated as a *pleurify* (which fee), and may be then prevented by bleeding, antimonials, hot-wafhes, and pectoral drinks with nitre. Gibfon alfo advifes purging, in order to prevent the inflammation extending to the mufcles of the breaft and fhoulders, which ufually happens. He objects, however, without fufficient reafon, to outward applications; except when any fwelling appears, with any tendency to break; in which cafe he advifes to haften fuppuration by the common methods. This, it fhould be recollected, is a chronic difeafe; and, like rheumatifm, admits of bliftering, fetons, and the free ufe of external ftimulants to the cheft.

Mr. Clark obferves, that the diftinction of this diforder into two kinds is not warranted by any good reafon; and accordingly he gives the following account of the fymptoms that occur in the different ftages of this diforder, together with the circumftances that have appeared on diffecting horfes that have died of it. The founder, he fays, always proceeds from cold too fuddenly applied to the body; and whether it be from a current of cold air, or from plunging the body into cold water, when over-heated, the effects are the fame. The fymptoms at firft are thefe; when the horfe begins to cool, he appears very ftiff and feeble in his fore-quarters, and, when forced to move forwards, he collects his body, as it were, into a heap, and brings his hind feet as far forward under his body as he poffibly can, in order to remove the preffure of the weight of his body from the fore-legs and feet: at the fame time, he fets his fore-feet to the ground with feeming great pain: his fore parts are extremely hot, the legs confiderably fwelled, and evidently painful to the animal when touched; a violent fever fucceeds, which, if not properly treated, terminates in death, or, if the horfe furvives the fhock, in incurable lamenefs. On diffecting the legs and fhoulders of thofe horfes that have died, after an illnefs of a few days, of this diforder, the blood is generally found extravafated, the parts having a black appearance, efpecially between the fkin and the flefh. The fame blacknefs is likewife obferved in the cellular membrane, between the interftices of the mufcles and tendons; the texture of the veffels is alfo deftroyed, and their fubftance mortified. Mr. Clark ftates, that plunging horfes into cold water, when they are over-heated, tends to weaken them; and he alleges this proof of it, communicated by a fportfman well acquainted with horfes, that, in hunting, when horfes are over-heated, and obliged to go through deep water, efpecially if they are obliged to fwim, they foon after become faint, jaded, and tired. This is a fact well worthy of notice.

FOUNDERY, or Foundry, the art of melting and cafting all forts of metals; particularly brafs, iron, bell-metal, &c. The word is alfo ufed for a place, or work-houfe, furnifhed with furnaces, or forges for this purpofe. A foundery, in the iron manufacture, is almoft always connected with the blaft furnace where the metal is fmelted from the ore; from this circumftance we fo frequently find the fmelting furnace and its appendages termed a foundery, though in reality the word fhould be confined to the building for cafting up the metal manufactured at the former; it is there termed the cafting-houfe, (fee the article Blast *furnace.*) The cafting-houfe, or foundery, is fituated on one of the fides of the furnace, the furface of its ground about two feet below the level of the bottom of the hearth of the furnace. The floor of the foundery fhould be about ten feet deep, with the loamy fand, as mentioned in the article Casting, of which the moulds are formed; this is for the convenience of burying large moulds beneath the furface, fo that the metal may be conveyed into them by fmall channels or foughs hollowed out in the fand. A moft important circumftance to be attended to is, that the foundery is well drained of water, as any dampnefs in moulds would produce the fatal explofions by the fudden expanfion of the fteam. When the hot metal is introduced into a wet mould, many ferious accidents have arifen from a want of attention to this very neceffary circumftance; in fuch a cafe, the moulds are burft afunder, the ground torn up and the fluid metal thrown in every direction amongft the workmen, occafioning as much damage from its projectile force, as from its great heat, to thofe on whom it falls. Every foundery is furnifhed with a crane, or fometimes two, placed fo as to command the whole for the convenience of taking up and removing heavy pieces of cafting from any part of the place. At Buttlerby iron works, Derbyfhire, we noticed an excellent crane for a foundery; the pulley from which the goods are fufpended is not fixed to the end of the gib, but flided upon it by means of a rack moved by a pinion, which can be turned with eafe by the workman, fo as to give the crane any range within its reach; and it can take up weights as well at fix feet from the centre as at ten, which renders it a moft ufeful implement in fuch a fituation, where the crane is frequently ufed to lower down moulds upon one another in a perpendicular direction, as mentioned in the article Casting.

The moft complete founderies are provided with two or more air or reverberating furnaces, (fee Furnace,) in which the metal is melted occafionally, either when the metal contained in the blaft furnace is not fufficient, or when the quality of the metal made there is not proper for cafting, owing to its containing too much or too little carbon, and it requires mixing with better or worfe metal to render it fit for the purpofe.

They have alfo two or three cupolas, or fmall blaft furnaces, to melt fmall quantities of metal, particularly when it is wanted in hafte, as the reverberatories are much longer in filling their charge of metal, though it is in greater quantity; but the latter does not fo well anfwer the purpofes of the iron founder, becaufe it would require fo great a ftock of flafks and implements to make moulds to receive a large quantity of metal; for this reafon they feldom employ the reverberatory but for large articles which require the whole charge; fmaller goods are caft from the cupolas.

In the foundery of a blaft furnace, a pit is funk at a convenient diftance from the furnace, and the moulds for pipes, and other fimilar articles, are placed vertically in it, within reach of the crane: the metal is conveyed by gutters or foughs from the furnace, and a fmall iron trough, filled with fand, leads the fluid metal into each of the moulds; thefe are a confiderable improvement on the old method of burying them in the fand, in the faving of labour and time; the flafks are made of caft iron for the purpofe.

It has of late become a practice at our moft extenfive foun-

founderies, to fubftitute fand for loam caftings in many cafes where a great number of articles of one kind are to be caft, fo that the expence of the flafks is not an object of importance; where the articles are intricate, the fand is wetted fo much to render it fufficiently adhefive, that it is neceffary to dry the moulds to avoid the danger of an explofion: for this purpofe large ftoves are ufed, and carriages adapted, on which to convey a great number of moulds into the ftove at once, and when fufficiently dry, which generally happens in about half an hour, they are withdrawn, and a new fet placed on the carriage.

A foundery is generally provided with a boring-mill for forming the internal furface of the cylinders caft for fteam-engines, &c. (fee Cylinder *boring*), and the fame machinery turns large lathes, for turning heavy mill axes, piftons, rollers for fugar-mills, and laminating rollers; the fame mill gives motion to all thefe, and alfo blows the cupolas, though at a blaft-furnace thefe are fupplied by a fmall pipe from the great blowing-engine for the furnace.

Foundery *of fmall works, or the manner of cafting in fand.*—The fand ufed by the founders, in cafting brafs, &c. is yellowifh, and pretty foft; but, after it has been ufed, it becomes quite black, becaufe of the charcoal-duft ufed in the moulds. Every time they would ufe this fand, they work and tew it, feveral times over, on a board about a foot fquare, placed over a kind of trunk, or box, into which it may fall from off the board. This tewing is performed with a roller, or cylinder, about two feet long, and two inches in diameter; and a kind of knife, made of the blade of a fword: with thefe two inftruments they alternately roll and cut the fand; and, at length, turn it down into the box or trough underneath.

Then, taking a wooden board, or table, of a length and breadth proportional to the quantity of things to be caft; round this they put a frame or ledge; and thus make a fort of mould. This mould they fill with the fand before prepared, and moderately moiftened: which done, they take wooden, or metalline models, or patterns of the things intended to be caft: apply them on the mould, and prefs them down in the fand, fo as to leave their form indented; along the middle of the mould is laid half a little cylinder of brafs, which is to be the mafter-jet, or canal for running the metal; being fo difpofed, as to touch the ledge on one fide, and only to reach to the laft pattern on the other: from this are placed feveral leffer jets or branches, reaching to each pattern, whereby the metal is conveyed through the whole frame.

This firft frame being thus finifhed, they turn it upfide down, to take out the pattern from the fand; in order to which, they firft loofen them a little all round, with a fmall cutting inftrument.

After the fame manner they proceed to work the counterpart, or other half of the mould, with the fame patterns, in a frame exactly like the former; excepting that it has pins, which, entering holes correfponding thereto in the other, make, when the two are joined together, the two cavities of the pattern fall exactly on each other.

The frame, being thus moulded, is carried to the founder, or melter; who, after enlarging the principal jet, or canal, of the counter-part, with a kind of knife, adding the crofs jets, or canals, to the feveral patterns in both, and fprinkling them over with mill-duft, fets them to dry in an oven.

When both parts of the mould are fufficiently dried, they join them together, by means of the pins; and to prevent their ftarting, or flipping afide, by the force of the metal, which is to come in flaming hot, through a hole contrived at the mafter-jet, they lock them in a kind of prefs, either with fcrews; or if the mould be too big for this, with wedges. The moulds, thus put in the prefs, are ranged near the furnace, to be in readinefs to receive the metal as it comes out of the crucible.

While the moulds are thus preparing, the metal is put in fufion in an earthen crucible, about ten inches high, and four in diameter.

The furnace wherein the fufion is made is much like the fmith's forge; having, like that, a chimney, to carry off the fmoke; a pair of bellows to blow up the fire; and a hearth where the fire is made, and the crucible placed. It is the ufe of this hearth, that chiefly diftinguifhes the furnace from the forge.

In the middle thereof is a fquare cavity, ten or twelve inches wide, which goes to the very bottom: it is divided into two, by an iron grate: the upper partition ferves to hold the crucible, and the fuel, and the lower to receive the afhes.

When the fuel, which is to be of dry wood, is pretty well lighted, they put the crucible full of metal in the middle, and cover it with an earthen lid; and, to increafe the force of the fire, befides blowing it up with the bellows, they lay a tile over part of the aperture or cavity of the furnace.

The metal firft put in being brought to a fufion, they fill the crucible with pieces of brafs beaten in a mortar; to put them in they make ufe of a kind of iron ladle, with a long fhank at the end thereof, formed into a kind of hollow cylinder, out of which the piece is dropped.

Nothing now remains, but for the founder to take the crucible out of the fire, and carry it in a pair of iron tongs (whofe feet are bent, the better to embrace the top of the crucible) to the mould; into which he pours the melted metal, through the hole anfwering to the mafter-jet of each mould.

Thus he goes fucceffively, from one to another, till his crucible is emptied, or there is not matter enough left for another mould.

Then cafting cold water on the moulds, they take the frames out of the preffes, and the caft works out of the fand: which afterwards they work again, for another cafting. Laftly, they cut off the jets, or cafts, and fell or deliver the work to thofe who befpoke it, without any farther repairing. See Brass and Casting.

Foundery *of ftatues, great guns, and bells.*—The art of cafting ftatues in brafs is very ancient; infomuch that its origin was too remote and obfcure even for the refearch of Pliny; an author admirably fkilled at difcovering the inventors of other arts.

All we can learn for certain is, that it was practifed, in all its perfection, firft among the Greeks; and afterwards among the Romans: and that the number of their ftatues confecrated to their gods and heroes furpaffed all belief. See Statue.

The fingle cities of Athens, Delphos, Rhodes, &c. had each three thoufand ftatues; and Marcus Scaurus alone, though only ædile, adorned the circus with no lefs than three thoufand ftatues of brafs, for the time of the Circenfian games. This tafte for ftatues was finally carried to fuch a pitch, that it became a proverb, that in Rome the people of brafs were not lefs numerous than the Roman people.

Among us, the cafting of ftatues was but little known or practifed before the feventeenth century.

As to the *cafting of guns*, it is quite modern; and it were perhaps to be wifhed, we were as ignorant of it as the ancients,

ancients. All authors agree, that the firſt cannon were caſt in the fourteenth century; though ſome affix the event to the year 1338, and others to 1380. See CANNON and GUNNERY.

The *caſting of bells* is of a middle ſtanding, between the other two. The uſe of bells is certainly very ancient in the weſtern church; and the ſame were likewiſe once uſed in the church of the eaſt. But, at preſent, F. Vanſleb aſſures us, in his ſecond account of Egypt, he had found but one bell in all the eaſtern church, and that in a monaſtery in the Upper Egypt. See BELL.

The matter of theſe large works is rarely any ſimple metal, but commonly a mixture of ſeveral. We ſhall here give the proceſs in the foundery of each.

Method of caſting ſtatues of figures. See BRONZE.

There are three things chiefly required in caſting of ſtatues, buſts, baſſo-relievos, vaſes, and other works of ſculpture: *viz.* the mould, the wax, and ſhell, or coat. The inner mould, or core (thus called from *cœur*, as being in the heart or middle of the ſtatue), is a rude lumpiſh figure, to which is given the attitudes and contours of the ſtatue intended; it is raiſed on an iron grate, ſtrong enough to ſuſtain it; and is ſtrengthened withinſide by ſeveral bars, or ribs of iron.

It may be made at the diſcretion of the workmen; of potters' clay, mixed up with horſe-dung and hair; or of plaſter of Paris, mixed with fine brick-duſt.

The uſe of the core in ſtatues is to ſupport the wax and ſhell, to leſſen the weight, and to ſave metal. In bells it takes up all the inſide, and preſerves the ſpace vacant where the clapper is hung. In great guns it forms the whole chace, from the mouth to the breech: and, in mortars, the chace and chamber. The iron bars and the core are taken out of the braſs figure, through an aperture left in it, which is afterwards ſoldered up: but it is neceſſary to leave ſome of the iron bars of the core that contribute to the ſteadineſs of the projecting parts, within the braſs figure.

The wax is a repreſentation of the intended ſtatue. If it be a piece of ſculpture, the wax muſt be all of the ſculptor's own hand, who uſually faſhions it on the core itſelf; though it may be wrought ſeparately in cavities, moulded, or formed, on a model, and afterwards diſpoſed and arranged on the ribs of iron over the grate, as before, filling the vacant ſpace in the middle with liquid plaſter and brick-duſt; by which means the inner mould, or core, is formed in proportion as the ſculptor carries on the wax.

When the wax (which is to be of the intended thickneſs of the metal) is finiſhed, they fix little waxen tubes perpendicularly to it, from top to bottom; to ſerve, both as jets, for the conveyance of the metal to all parts of the work: and as vent holes, to give paſſage to the air, which would, otherwiſe, occaſion great diſorder, when the hot metal came to encompaſs it. By the weight of the wax uſed herein, is that of the metal adjuſted; ten pounds of this laſt being the proportion to one pound of the former. The work brought thus far, wants nothing but to be covered with its ſhell; which is a kind of coat, or cruſt, laid over the wax: and which, being of a ſoft matter, and even, at firſt, liquid, eaſily takes and preſerves the impreſſion of every part thereof; which it afterwards communicates to the metal, upon its taking the place of the wax, between the ſhell and the core. The matter of this outer mould, or ſhell, is varied according as different layers, or ſtrata are applied. The firſt is a compoſition of clay, and old white crucibles, well ground and ſifted, and mixed up with water, to the conſiſtence of a colour fit for painting: accordingly, they apply it with a pencil, laying it ſeven or eight times over, letting it dry between the intervals. For the ſecond impreſſion, they add horſes' dung and natural earth to the former compoſition. The third impreſſion is only horſes' dung and earth. Laſtly, the ſhell is finiſhed by laying on ſeveral more impreſſions of this laſt matter, made very thick with the hand.

The ſhell, thus finiſhed, is ſecured and ſtrengthened by ſeveral bands, or girts of iron, wound around it at half a foot's diſtance from one another, and faſtened at bottom to the grate under the ſtatue; and at the top to a circle of iron, where they all terminate.

Here it muſt be obſerved, that if the ſtatue be ſo big, that it would not be eaſy to move the moulds, when thus provided, it muſt be wrought on the ſpot where it is to be caſt.

This is performed two ways; in the firſt, a ſquare hole is dug under-ground, much bigger than the mould to be made therein, and its inſides lined with walls of freeſtone, or brick. At the bottom is made a hole, of the ſame materials, with a kind of furnace, having its aperture outwards: in this is a fire to be lighted, to dry the mould; and afterwards, to melt the wax. Over this furnace is placed the grate; and on this the mould, &c. framed as before explained. Laſtly, at one of the edges of the ſquare pit is made another large furnace, to melt the metal, as hereafter mentioned.

In the other way, it is ſufficient to work the mould above-ground: but with the ſame precaution of a furnace, and grate, underneath: when finiſhed, four walls are to be run up round it: and, by the ſide thereof, a maſſive made, for a melting furnace. For the reſt, the method is the ſame in both. The mould being finiſhed, and incloſed between four walls, whether under-ground, or above it, a moderate fire is lighted in the furnace under it, and the hole covered with planks, that the wax may melt gently down, and run out at pipes contrived for the purpoſe, at the foot of the mould; which are afterwards very exactly cloſed with earth, as ſoon as all the wax is carried off.

This done, the hole is filled up with bricks thrown in at random, and the fire in the furnace is augmented till ſuch time as both the bricks and the mould become red-hot; which ordinarily happens in twenty-four hours. Then, the fire being extinguiſhed, and every thing cold again, they take out the bricks, and fill up their place with earth, moiſtened, and a little beaten, to the top of the mould, in order to make it the more firm and ſteady.

Things being in this condition, there remains nothing but to melt the metal, and run it into the mould; this is the office of the furnace above, which is made in manner of an oven, with three apertures; one to put in the wood; another for a vent; and a third to run the metal out at. From this laſt aperture, which is kept very cloſe whilſt the metal is in fuſion, a little tube or canal is laid, whereby the melted metal is conveyed into a large earthen baſon over the mould; into the bottom of which all the big branches of the jets, or caſts, which are to carry the metal into all the parts of the mould, are inſerted.

It muſt be added, that theſe jets are all terminated, or ſtopped with a kind of plugs, which are kept cloſe, that upon opening the furnace the braſs, which guſhes out like a torrent of fire, may not enter any of them till the baſon be full enough of matter to run into them all at once; upon which occaſion they pull out the plugs, which are long iron rods, with a head at one end, capable of filling the whole diameter of each tube. The hole of the furnace

is opened with a long piece of iron, fitted at the end of a pole; and the mould is then filled in an inftant. The work is now finifhed, at leaft fo much as belongs to the cafting, the reft being the fculptor's or carver's bufinefs; who, taking the figure out of the mould and earth with which it is encompaffed, faws off the jets, wherewith it appears covered over; and repairs it, with inftruments proper to his art; as chiffels, gravers, puncheons, &c.

The manner of cafting bells.—What has been hitherto fhewn of the cafting of ftatues, holds, in proportion, of the cafting of bells; that which is particular in thefe latter is as follows: firft, then, the metal is different; there being no tin in the metal of ftatues, but no lefs than a fifth part of tin in that of bells. Secondly, the dimenfions of the core, and the wax of bells, efpecially if it be a ring of feveral bells that is to be caft, are not left to chance, or the caprice of the workman; but muft be meafured, on a kind of fcale, or diapafon; which gives the height, aperture, and thicknefs, neceffary for the feveral tones required.

It need not be added, that it is on the wax that the feveral mouldings and other ornaments, and infcriptions, to be reprefented in relievo, on the outfide of the bell, are formed. The clapper, or tongue, is not properly a part of the bell, but is furnifhed from other hands. In Europe, it is ufually of iron, with a large knob at the extreme; and is fufpended in the middle of the bell. In China, it is only a huge wooden mallet, ftruck by force of arm againft the bell; whence they can have but little of that confonancy, fo much admired in fome of our rings of bells. The Chinefe have an extraordinary way of increafing the found of their bells; *viz.* by leaving a hole under the cannon; which our bell-founders would reckon a defect.

The proportions of our bells differ very much from thofe of the Chinefe. In our's, the modern proportions are, to make the diameter fifteen times the thicknefs of the brim, and the height twelve times. The parts of a bell are, 1. The founding bow, terminated by an inferior circle, which grows thinner and thinner. 2. The brim or that part of a bell whereon the clapper ftrikes, and which is thicker than the reft. 3. The outward finking of the middle of the bell, or the point under which it grows wider to the brim. 4. The waift or furniture, and the part that grows wider and thicker quite to the brim. 5. The upper vafe, or that part which is above the waift. 6. The pallet which fupports the ftaple of the clapper within. 7. The bent and hollowed branches of metal uniting with the cannons, to receive the iron keys, whereby the bell is hung up to the beam which is its fupport and counterpoife, when rung out. The bufinefs of bell-foundery is reducible to three particulars. 1. The proportion of a bell. 2. The forming of the mould. And, 3. The melting of the metal. There are two kinds of proportions, *viz.* the fimple and the relative; the former are thofe proportions only that are between the feveral parts of a bell to render it fonorous; the relative proportions eftablifh a requifite harmony between feveral bells. The method of forming the profile of a bell, previoufly to its being caft, in which the proportion of the feveral parts may be feen, is as follows: the thicknefs of the brim, C 1 (fee *Plate* XV. *Mifcellan. fig.* 1.) is the foundation of every other meafure, and is divided into three equal parts. Firft, draw the line H D, which reprefents the diameter of the bell; bifect it in F and erect the perpendicular F f; let D F and H F be alfo bifected in E and G, and two other perpendiculars, E e, G a, be erected at E and G: G E will be the diameter of the top or upper vafe, *i. e.* the diameter of the top will be half that of the bell; and it will, therefore, be the diameter of the bell which will found an octave to the other. Divide the diameter of the bell or the line H D into fifteen equal parts, and one of thefe will give C 1 the thicknefs of the brim; divide again each of thefe fifteen equal parts into three other equal parts, and then form a fcale. From this fcale take twelve of the larger divifions, or $\frac{2}{15}$ of the whole fcale in the compafs, and fetting one leg in D defcribe an arc to cut the line E e in N, draw N D, and divide this line into twelve equal parts; at the point 1 erect the perpendicular 1 C = 10, and C 1 will be the thicknefs of the brim = $\frac{1}{15}$ of the diameter: draw the line C D: bifect D N and at the point of bifection 6 erect the perpendicular 6 K = $1\frac{1}{2}$ of the larger divifions on the fcale. With an opening of the compafs equal to twice the length of the fcale or thirty brims, fetting one leg in N, defcribe an arc of a circle, and with the fame leg in K and the fame opening defcribe another arc to interfect the former: on this point of interfection, as a centre, and with a radius equal to thirty brims, defcribe the arc N K; in 6 K produced take K B = $\frac{1}{3}$ of the larger meafure of the fcale or $\frac{1}{3}$ of the brim, and on the fame centre with the radius $30\frac{1}{3}$ brims defcribe an arc A B parallel to N K. For the arc B C, take twelve divifions of the fcale or twelve brims in the compafs, find a centre, and from that centre, with this opening, defcribe the arc B C, in the fame manner as N K or A B was defcribed. There are various ways of defcribing the arc K p; fome defcribe it on a centre at the diftance of nine brims from the points p and K; others, as it is done in the figure, on a centre at the diftance only of feven brims from thofe points. But it is neceffary firft to find the point p, and to determine the rounding of the bell p 1. For this purpofe, on the point C as a centre and with the radius C 1 defcribe the arc 1 p n; bifect the part 1, 2 of the line D n, and erecting the perpendicular p m, this perpendicular will cut the arc 1 p n in m, which terminates the rounding 1 p. Some founders make the bendings K a third of a brim lower than the middle of the line D N; others make the part C 1 D more acute, and inftead of making C 1 perpendicular to D N at 1, draw it $\frac{1}{6}$th of a brim higher, making it ftill equal to one brim; fo that the line 1 D is longer than the brim C 1. In order to trace out the top-part N *a*, take in the compafs eight divifions of the fcale or eight brims, and on the points N and D, as centres, defcribe arcs to interfect each other in 8; on this point 8, with a radius of eight brims, defcribe the arc N b; this arc will be the exterior curve of the top or crown; on the fame point 8, as a centre and with a radius equal to $7\frac{2}{3}$ brims, defcribe the arc A c, and this will be the interior curve of the crown, and its whole thicknefs will be one-third of the brim. As the point 8 does not fall in the axis of the bell, a centre M may be found in the axis by defcribing, with the interval of eight brims on the centres D and H, arcs which will interfect in M; and this point may be made the centre of the inner and outer curves of the crown, as before. The thicknefs of the cap which ftrengthens the crown at Q is about one-third of the thicknefs of the brim; and the hollow branches or ears about one-fixth of the diameter of the bell. The height of the bell is in proportion to its diameter as twelve to fifteen, or in the proportion of the fundamental found to its third major; whence it follows that the found of a bell is principally compofed of the found of its extremity or brim, as a fundamental, of the found of the crown which is an octave to it, and of that of the height which is a third. Encyclopedie, Art. CLOCHE. See BELL.

The particulars neceffary for making the mould of a bell are, 1. The earth: the moft cohefive is the beft; it muft be well ground and fifted, to prevent any chinks. 2. Brickftone; which muft be ufed for the mine, mould, or core,

and

and for the furnace. 3. Horſe dung, hair, and hemp, mixed with the earth, to render the cement more binding. 4. The wax for inſcriptions, coats of arms, &c. 5. The tallow equally mixed with the wax, in order to put a ſlight layer of it upon the outer mould, before any letters are applied to it. 6. The coals to dry the mould.

For making the mould, they have a ſcaffold conſiſting of four boards, ranged upon treſſels. Upon this they carry the earth, groſsly diluted, to mix it with horſe-dung, beating the whole with a large ſpatula.

The compaſſes of conſtruction are the chief inſtrument for making the mould, which conſiſt of two different legs, joined by a third piece. And laſt of all, the founders' ſhelves, on which are the engravings of the letters, cartridges, coats of arms, &c.

They firſt dig a hole, of a ſufficient depth to contain the mould of the bell, together with the caſe, or cannon, under ground; and about ſix inches lower than the terre-plein, where the work is performed. The hole muſt be wide enough for a free paſſage between the mould and walls of the hole; or between one mould and another, when ſeveral bells are to be caſt. At the centre of the hole is a ſtake erected, that is ſtrongly faſtened in the ground. This ſupports an iron-peg, on which the pivot of the ſecond branch of the compaſſes turns. The ſtake is encompaſſed with a ſolid brick-work, perfectly round, about half a foot high, and of the propoſed bell's diameter. This they call a millſtone. The parts of the mould are the core, the model of the bell, and the ſhell. When the outer ſurface of the core is formed, they begin to raiſe the core, which is made of bricks that are laid in courſes of equal height upon a layer of plain earth. At the laying of each brick, they bring near it the branch of the compaſſes, on which the curve of the core is ſhaped, ſo as that there may remain between it and the curve the diſtance of a line, to be afterwards filled up with layers of cement. The work is continued to the top, only leaving an opening for the coals to bake the core. This work is covered with a layer of cement made of earth and horſe-dung, on which they move the compaſſes of conſtruction, to make it of an even ſmoothneſs every where.

The firſt layer being finiſhed, they put the fire to the core, by filling it half with coals, through an opening that is kept ſhut, during the baking, with a cake of earth, that has been ſeparately baked. The firſt fire conſumes the ſtake, and the fire is left in the core half, or, ſometimes, a whole day: the firſt layer being thoroughly dry, they cover it with a ſecond, third, and fourth; each being ſmoothed by the board of the compaſſes, and thoroughly dried before they proceed to another.

The core being completed, they take the compaſſes to pieces, with intent to cut off the thickneſs of the model, and the compaſſes are immediately put in their place, to begin a ſecond piece of the mould. It conſiſts of a mixture of earth and hair, applied with the hand on the core, in ſeveral cakes that cloſe together. This work is finiſhed by ſeveral layers of a thinner cement of the ſame matter, ſmoothed by the compaſſes, and thoroughly dried, before another is laid on. The laſt layer of the model is a mixture of wax and greaſe ſpread over the whole. After which are applied the inſcriptions, coats of arms, &c. beſmeared with a pencil dipped in a veſſel of wax on a chaffing-diſh: this is done for every letter. Before the ſhell is begun, the compaſſes are taken to pieces, to cut off all the wood that fills the place of the thickneſs to be given to the ſhell.

The firſt layer is the ſame earth with the reſt, ſifted very fine; whilſt it is tempering in water, it is mixed with cow's hair, to make it cohere. The whole being a thin cullis, is gently poured on the model, that ſinks exactly all the ſinuoſities of the figures, &c. and this is repeated till the whole is two lines thick over the model. When this layer is thoroughly dried, they cover it with a ſecond of the ſame matter, but ſomething thicker: when this ſecond layer becomes of ſome conſiſtence, they apply the compaſſes again, and light a fire in the core, ſo as to melt off the wax of the inſcriptions, &c.

After this, they go on with other layers of the ſhell, by means of the compaſſes. Here they add to the cow's hair a quantity of hemp, ſpread upon the layers, and afterwards ſmoothed by the board of the compaſſes. The thickneſs of the ſhell comes to four or five inches lower than the millſtone before obſerved, and ſurrounds it quite cloſe, which prevents the extravaſation of the metal. The wax ſhould be taken out before the melting of the metal.

The ear of the bell requires a ſeparate work, which is done during the drying of the ſeveral incruſtations of the cement. It has ſeven rings, the ſeventh is called the bridge, and unites the others, being a perpendicular ſupport to ſtrengthen the curves. It has an aperture at the top, to admit a large iron peg, bent at the bottom; and this is introduced into two holes in the beam, faſtened with two ſtrong iron keys. There are models made of the rings, with maſſes of beaten earth, that are dried in the fire, in order to have the hollow of them. Theſe rings are gently preſſed upon a layer of earth and cow's hair, one-half of its depth; and then taken out without breaking the mould. This operation is repeated twelve times for twelve half-moulds, that two and two united may make the hollows of the ſix rings: the ſame they do for the hollow of the bridge, and bake them all, to unite them together.

Upon the open place left for the coals to be put in, are placed the rings that conſtitute the ear. They firſt put into this open place the iron ring to ſupport the clapper of the bell; then they make a round cake of clay, to fill up the diameter of the thickneſs of the core. This cake, after baking, is clapped upon the opening, and ſoldered with a thin mortar ſpread over it, which binds the cover cloſe to the core.

The hollow of the model is filled with an earth, ſufficiently moiſt, to fix on the place, which is ſtrewed, at ſeveral times, upon the cover of the core; and they beat it gently with a peſtle to a proper height; and a workman ſmooths the earth at top with a wooden trowel dipped in water.

Upon this cover, to be taken off afterwards, they aſſemble the hollows of the rings. When every thing is in its proper place, they ſtrengthen the outſide of the hollows with mortar, in order to bind them with the bridge, and keep them ſteady at the bottom, by means of a cake of the ſame mortar which fills up the whole aperture of the ſhell. This they let dry, that it may be removed without breaking. To make room for the metal they pull off the hollows of the rings, through which the metal is to paſs, before it enters into the vacuity of the mould. The ſhell being unloaded of its ear, they range under the millſtone five or ſix pieces of wood, about two feet long, and thick enough to reach almoſt the lower part of the ſhell; between theſe and the mould they drive in wooden wedges with a mallet, to ſhake the ſhell of the model whereon it reſts, ſo as to be pulled up, and got out of the pit.

When this and the wax are removed, they break the model and layer of earth, through which the metal muſt run, from the hollow of the rings, between the bell and the core.

They

They fmoke the infide of the fhell, by burning ftraw under it, that helps to fmooth the furface of the bell. Then they put the fhell in the place, fo as to leave the fame interval between that and the core; and before the hollows of the rings or the cap are put on again, they add two vents, that are united to the rings, and to each other, by a mafs of baked cement. After which they put on this mafs of the cap, the rings, and vents, over the fhell, and folder it with thin cement, which is dried gradually by covering it with burning coals. Then they fill up the pit with earth, beating it ftrongly all the time, round the mould.

The furnace has a place for the fire, and another for the metal. The fire-place has a large chimney, with a fpacious afh-hole: the furnace which contains the metal is vaulted, whofe bottom is made of earth, rammed down; the reft is built with brick. It has four apertures; the firft, through which the flame reverberates; the fecond is clofed with a ftopple, that is opened for the metal to run; the others are to feparate the drofs, or fcoriæ, of the metal by wooden rakes; through thefe laft apertures paffes the thick fmoke. The ground of the furnace is built floping, for the metal to run down. See Dict. Commerc. Eng. edit. art. FOUNDERY.

FOUNDERY. *Manner of cafting great guns, or pieces of artillery.*—The cafting of cannons, mortars, and other pieces of artillery, is performed much like that of ftatues and bells; efpecially as to what regards the wax, fhell, and furnaces.

All pieces of artillery are now caft folid, and bored afterwards, by means of a machine invented at Strafburgh, (fee *Boring of* CANNON,) and much improved by Mr. Verbruggen, head founder at Woolwich. The gun to be bored was at firft placed in a perpendicular pofition; but the machines ufed for this purpofe have lately been made to bore horizontally, and much more exactly than thofe that bore in a vertical fituation. Whilft the infide is bored, the outfide is turned and polifhed at the fame time.

As to the metal, it is fomewhat different from both; as having a mixture of tin, which is not in that of ftatues; and only having half the quantity of tin that is in bells, *i. e.* at the rate of ten pound of tin to an hundred of copper. The refpective quantities of different metals that fhould enter into the compofition for brafs cannon is not abfolutely decided; the moft common proportions of the ingredients are the following: *viz.* to 240lb. of metal fit for cafting, they put 68lb. of copper, 25lb. of brafs, and 12lb. of tin. To 4200lb. of metal fit for cafting, the Germans put 3687$\frac{33}{41}$lb. of copper, 204$\frac{13}{41}$lb. of brafs, and 307$\frac{30}{41}$lb. of tin. Others, again, ufe 100lb. of copper, 6lb. of brafs, and 9lb. of tin; and laftly, others make ufe of 100lb. of copper, 10lb. of brafs, and 15lb. of tin. See CANNON.

A cannon is always fhaped a little conical, being thickeft of metal at the breech, where the greateft effort of the gunpowder is made, and diminifhing thence to the muzzle; fo that if the mouth be two inches thick of metal, the breech is fix. See CANNON.

Its length is meafured in calibers, *i. e.* in diameters of the muzzle. Six inches at the muzzle require twenty calibers, or ten feet in length; there is always about the fixth of an inch allowed play for the ball. For the parts, and their refpective proportions of different forts of guns, fee CANNON and GUN. The method of cafting iron cannon differs very little from that of brafs.

FOUNDERY, *Letter, or the method of cafting printing Letters.*—The invention of printing letters we fhall fpeak of under PRINTING and LETTER.

Their difference, kind, &c. have already been explained under the articles CHARACTER, &c.

In the bufinefs of cutting, cafting, &c. letters for printing, the letter-cutter muft be provided with a vice, hand-vice, hammers and files of all forts for watch-makers' ufe; as alfo gravers and fculpters of all forts, and an oil-ftone, &c. fuitable and fizeable to the feveral letters to be cut: a flat gauge made of box to hold a rod of fteel, or the body of a mould, &c. exactly perpendicular to the flat of the ufing-file: a fliding gauge, whofe ufe is to meafure and fet off diftances between the fhoulder and the tooth, and to mark it off from the end, or from the edge of the work; a face-gauge, which is a fquare notch cut with a file into the edge of a thin plate of fteel, iron, or brafs, of the thicknefs of a piece of common tin, whofe ufe is to proportion the face of each fort of letter, *viz.* long letters, afcending letters, and fhort letters. So there muft be three gauges, and the gauge for the long letters is the length of the whole body fuppofed to be divided into forty-two equal parts. The gauge for the afcending letters, Roman and Italic, are $\frac{5}{7}$, or 30 parts of 42, and 33 parts for the Englifh face. The gauge for the fhort letters is $\frac{3}{7}$ or 18 parts of 42 of the whole body for the Roman and Italic, and 22 parts for the Englifh face.

The Italic and other ftanding gauges are to meafure the fcope of the Italic ftems, by applying the top and bottom of the gauge to the top and bottom lines of the letters, and the other fide of the gauge to the ftem; for when the letter complies with thefe three fides of the gauge, that letter has its true fhape.

The next care of the letter-cutter is to prepare good fteel punches, well-tempered, and quite free from all veins of iron; on the face of which he draws or marks the exact fhape of the letter, with pen and ink, if the letter be large; or with a fmooth blunted point of a needle, if it be fmall; and then with fizeable and proper fhaped and pointed gravers and fculpters, digs or fculps out the fteel between the ftrokes or marks he made on the face of the punch, and leaves the marks ftanding on the face. Having well fhaped the infide ftrokes of his letter, he deepens the hollows with the fame tools: for if a letter be not deep in proportion to its width, it will, when ufed at prefs, print black, and be good for nothing. This work is generally regulated by the depth of the counter-punch. Then he works the outfide with proper files till it be fit for the matrice.

But before we proceed to the finking and juftifying of the matrices, we muft provide a mould to juftify them by, of which you have a draught in *Plate* XV. *Mifcellany*, *figs.* 2, 3.

Every mould is compofed of an upper and an under part. The under part is delineated in *fig.* 2. The upper part is marked *fig.* 3, and is in all refpects made like the under part, excepting the ftool behind, and the bow, or fpring, alfo behind; and excepting a fmall roundifh wire between the body and carriage, near the break where the under part hath a fmall rounding groove made in the body. This wire, or rather half-wire, in the upper part, makes the nick in the fhank of the letter, when part of it is received into the groove in the under part. Thefe two parts are fo exactly fitted and gauged into one another (*viz.* the male gauge, marked c in *fig.* 3. into the female marked g in *fig.* 2.) that when the upper part of the mould is properly placed on, and in the under part of the mould, both together, make the entire mould, and may be flid backwards for ufe fo far, till the edge of either of the bodies on the middle of either carriage comes juft to the edge of the female gauges, cut in each carriage: and they may be flid forwards

wards fo far, till the bodies on either carriage touch each other: and the fliding of thefe two parts of the mould backwards makes the fhank of the letter thicker, becaufe the bodies in each part ftand wider afunder, and the fliding them forwards makes the fhank of the letter thinner, becaufe the bodies on each part of the mould ftand clofer together.

The parts of the mould are as follow: *viz.*

a The carriage.
b The body.
c The male gauge.
d e The mouth-piece.
f i The regifter.
g The female gauge.
h The hag.
a a a a The bottom plate.
b b b The wood, on which the bottom plate lies.
c c c The mouth.
d d The throat.
e d d The pallet.
f The nick.
g g The ftool.
h h The fpring or bow.

Then the mould muft be juftified: and firft the founder juftifies the body, by cafting about twenty proofs or famples of letters, which are fet in a compofing ftick, with all their nicks towards the right hand; and then by comparing thefe with the pattern letters, fet up in the fame manner, he finds the exact meafure of the body to be caft. He alfo tries if the two fides of the body are parallel, or that the body be no bigger at the head than at the foot; by taking half the number of his proofs, and turning them with their heads to the feet of the other half; and if then the heads and the feet be found exactly even upon each other, and neither to drive out nor get in, the two fides may be pronounced parallel. He farther tries whether the two fides of the thicknefs of the letter be parallel by firft fetting his proofs in the compofing ftick with their nicks upwards; and then turning one-half with their heads to the feet of the other half: and if the heads and feet lie exactly upon each other, and neither drive out nor get in, the two fides of the thicknefs are parallel.

The mould thus juftified: the next bufinefs is to prepare the matrices. A matrice is a piece of brafs or copper of about an inch and a half long, and of a thicknefs in proportion to the fize of the letter it is to contain. In this metal is funk the face of the letter intended to be caft, by ftriking the letter punch about the depth of an n. After this the fides and face of the matrice muft be juftified and cleared, with files, of all bunchings made by finking the punch.

Every thing thus prepared, it is brought to the furnace, which is built of brick upright, with four fquare fides, and a ftone on the top, in which ftone is a wide round hole for the pan to ftand in. A foundery of any confequence has feveral of thefe furnaces in it.

As to the metal of which the types are to be caft, this, in extenfive founderies, is always prepared in large quantities; but caft into fmall bars of about twenty pounds weight to be delivered out to the workmen as occafion requires. In the letter foundery which has been long carried on with reputation, under the direction of Dr. Alexander Wilfon, and fons, at Glafgow, we are informed, that a ftock of metal is made up at two different times of the year, fufficient to ferve the cafters at the furnace for fix months each time. For this purpofe a large furnace is built under a fhade, furnifhed with a wheel vent, in order the more equally to heat the fides of a ftrong pot of caft iron, which holds, when full, fifteen hundred weight of the metal. The fire being kindled below, the bars of lead are let foftly down into the pot, and their fufion promoted by throwing in fome pitch and tallow, which foon inflame. An outer chimney, which is built fo as to project about a foot over the fartheft lip of the pot, catches hold of the flame by a ftrong draught, and makes it act very powerfully in melting lead; whilft it ferves at the fame time to convey away all the fumes, &c. from the workmen, to whom this laborious part of the bufinefs is committed. When the lead is thoroughly melted, a due proportion of the regulus of antimony and other ingredients are put in, and fome more tallow is inflamed, to make the whole incorporate fooner. The workmen now having mixed the contents of the pot very thoroughly, by ftirring long with a large iron ladle, next proceed to draw the metal off into the fmall troughs of caft iron which are ranged, to the number of fourfcore, upon a level platform, faced with ftone, built towards the right hand. In the courfe of a day fifteen hundred weight of metal can be eafily prepared in this manner; and the operation is continued for as many days as are neceffary to prepare a ftock of metal, of all the various degrees of hardnefs. After this the whole is difpofed into preffes, according to its quality, to be delivered out occafionally to the workmen.

The founder muft be now provided with a ladle, which differs nothing from other iron ladles, but in its fize. And he is provided always with ladles of feveral fizes, which he ufes according to the fize of the letter he is to caft. Before the cafter begins to caft, he muft kindle his fire in the furnace to melt the metal in the pan. Therefore he takes the pan out of the hole in the ftone, and there lays in coals and kindles them; and, when they are well kindled, he fets the pan in again and puts in metal into it to melt; if it be a fmall bodied letter he cafts, or a thin letter of great bodies, his metal muft be very hot; nay fometimes red-hot, to make the letter come. Then having chofen a ladle that will hold about fo much as the letter and break is, he lays it at the ftoking hole, where the flame burfts out, to heat. Then he ties a thin leather, cut with its narrow end againft the face to the leather groove of the matrice, by whipping a brown thread twice about the leather-groove, and faftening the thread with a knot. Then he puts both halves of the mould together, and puts the matrice into the matrice-cheek, and places the foot of the matrice on the ftool of the mould, and the broad end of the leather upon the wood of the upper half of the mould, but not tight up, left it might hinder the foot of the matrice from finking clofe down upon the ftool in a train of work. Then laying a little rofin on the upper-wood of the mould, and having his cafting-ladle hot, he with the boiling fide of it melts the rofin: and, when it is yet melted, preffes the broad end of the leather hard down on the wood, and fo faftens it to the wood: all this is the preparation.

Now he comes to cafting. Wherefore placing the under half of the mould in his left hand with the hook or hag forward, he clutches the ends of its wood between the lower part of the ball of his thumb and his three hind fingers; then he lays the upper half of the mould upon the under half, fo that the male gauges may fall into the female gauges, and at the fame time the foot of the matrice places itfelf upon the ftool; and, clafping his left hand

hand thumb ſtrong over the upper half of the mould he nimbly catches hold of the bow or ſpring with his right hand fingers at the top of it, and his thumb under it, and places the point of it againſt the middle of the notch in the backſide of the matrice, preſſing it as well forwards towards the mould, as downwards, by the ſhoulder, of the notch cloſe upon the ſtool, while at the ſame time with his hinder fingers, as aforeſaid, he draws the under half of the mould towards the ball of his thumb, and thruſts by the ball of his thumb the upper part towards his fingers, that both the regiſters of the mould may preſs againſt both ſides of the matrice, and his thumb and fingers preſs both halves of the mould cloſe together.

Then he takes the handle of his ladle in his right hand, and with the boll of it gives a ſtroke, two or three, outwards upon the ſurface of the melted metal, to ſcum or clear it from the film or duſt that may ſwim upon it; then takes up the ladle full of metal, and having his mould, as aforeſaid, in his left hand, he a little twiſts the left ſide of his body from the furnace, and brings the geat of his ladle (full of metal) to the mouth of the mould, and twiſts the upper part of his right hand towards him to turn the metal into it, while at the ſame moment of time he jilts the mould in his left hand forwards, to receive the metal with a ſtrong ſhake (as it is called); not only into the bodies of the mould, but while the metal is yet hot running, ſwiftly and ſtrongly, into the very face of the matrice, to receive its perfect form there, as well as in the ſhank.

Then he takes the upper half of the mould off the under half, by placing his right hand thumb on the end of the wood next his left hand thumb, and his two middle-fingers at the other end of the wood; and finding the letter and break lie in the under half of the mould, (as moſt commonly by reaſon of its weight it does,) he throws or toſſes the letter, break and all, upon a ſheet of waſte paper laid for that purpoſe on the bench, juſt a little beyond his left hand, and is then ready to caſt another letter as before; and alſo, the whole number that is to be caſt with that matrice.

A workman will ordinarily caſt about three thouſand of theſe letters in a day.

When the caſters at the furnace have got a ſufficient number of types upon the tables, a ſet of boys come, and nimbly break away the jets from them: the jets are thrown into the pots, and the types are carried away in parcels to other boys, who paſs them ſwiftly under their fingers, defended by leather, upon ſmooth flat ſtones, in order to poliſh their broad-ſides. This is a very dextrous operation, and is a remarkable inſtance of what may be effected by the power of habit and long practice; for theſe boys, in turning up the other ſide of the type, do it ſo quickly by a mere touch of the fingers of the left hand, as not to require the leaſt perceptible intermiſſion in the motion of the right hand upon the ſtone. The types, thus finely ſmoothed and flattened on the broad-ſides, are next carried to another ſet of boys, who ſit at a ſquare table, two on each ſide, and there are ranged up on long rulers, or ſticks, fitted with a ſmall projection, to hinder them from ſliding off backwards. When theſe ſticks are ſo filled, they are placed, two and two, upon a ſet of wooden pins fixed into the wall, near the dreſſer, ſometimes to the amount of a hundred, in order to undergo the finiſhing operations. This workman, who is always the moſt expert and ſkilful in all the different branches carried on at the foundery, begins by taking one of theſe ſticks, and, with a peculiar addreſs, ſlides the whole column of types off upon the dreſſing-ſtick: this is made of well-ſeaſoned mahogany, and furniſhed with two end-pieces of ſteel, a little lower than the body of the types, one of which is moveable, ſo as to approach the other by means of a long ſcrew-pin, inſerted in the end of the ſtick. The types are put into this ſtick with their faces next to the back or projection; and after they are adjuſted to one another ſo as to ſtand even when they are bound up, by ſcrewing home the moveable end-piece. It is here where the great and requiſite accuracy of the moulds comes to be perceived; for in this caſe the whole column, ſo bound up, lies flat and true upon the ſtick, the two extreme types being quite parallel, and the whole has the appearance of one ſolid continuous plate of metal. The leaſt inaccuracy in the exact paralleliſm of the individual type, when multiplied ſo many times, would render it impoſſible to bind them up in this manner, by diſpoſing them to riſe or ſpring from the ſtick by the ſmalleſt preſſure from the ſcrew. Now, when lying ſo conveniently with the narrow edges uppermoſt, which cannot poſſibly be ſmoothed in the manner before mentioned by the ſtones, the workman does this more effectually by ſcraping the ſurface of the column with a thick-edged but ſharp razor, which at every ſtroke brings on a very fine ſmooth ſkin, like to poliſhed ſilver; and thus he proceeds till in about half a minute he comes to the farther end of the ſtick. The other edges of the types are next turned upwards, and poliſhed in the ſame manner. It is whilſt the types thus lie in the dreſſing-ſtick that the operation of bearding or barbing is performed, which is effected by running a plane, faced with ſteel, along the ſhoulder of the body next to the face, which takes more or leſs off the corner, as occaſion may require. Whilſt in the dreſſing-ſtick they are alſo grooved, which is a very material operation. In order to underſtand this, it muſt be remembered, that when the types are firſt broken off from the jets, ſome ſuperfluous metal always remains, which would make them bear very unequally againſt the paper whilſt under the printing-preſs, and effectually mar the impreſſion. That all theſe inequalities may, therefore, be taken away, and that the bearings of every type may be regulated by the ſhoulders imparted to them all alike from the mould, the workman or dreſſer proceeds in the following manner. The types being ſcrewed up in the ſtick, as before mentioned, with the jet-end outermoſt, and projecting beyond the wood about one eighth of an inch, the ſtick is put into an open preſs, ſo as to preſent the jet-end uppermoſt, and then every thing is made faſt by driving a long wedge, which bears upon a ſlip of wood, which lies cloſe to the types the whole length: then a plough or plane is applied, which is ſo conſtructed as to embrace the projecting part of the types betwixt its long ſides, which are made of poliſhed iron. When the plane is thus applied, the ſteel cutter bearing upon that part between the ſhoulders of the types, where the inequalities lie, the dreſſer dextrouſly glides it along, and by this means ſtrips off every irregular part that comes in the way, and ſo makes an uniform groove the whole length, and leaves the two ſhoulders ſtanding; by which means every type becomes preciſely like to another, as to the height againſt paper. The types being now finiſhed, the ſtick is taken out of the preſs, and the whole column replaced upon the other ſtick; and after the whole are ſo dreſſed, he proceeds to pick out the bad letters, previouſly to putting them up into pages and papers. In doing this he takes the ſtick into his left hand, and turning the faces near to the light, he examines them carefully, and whenever an imperfect or damaged letter occurs, he nimbly plucks it out with a ſharp bodkin, which he holds in the right hand for that purpoſe. Thoſe letters which, from their form, project over the body of

of the type, and which cannot on this account be rubbed on the ftones, are fcraped on the broad-fides with a knife or file, and fome of the metal next the face pared away with a pen-knife, in order to allow the type to come clofe to any other. This operation is called kerning.

The excellence of printing types confifts not only in the due performance of all the operations above defcribed, but alfo in the hardnefs of the metal, form, and fine proportion of the character, and in the exact bearing and ranging of the letters in relation to one another.

FOUNDERY, *Military*. Under the feveral appropriate heads, we have furnifhed information regarding the feveral kinds of foundery neceffary to the eftablifhment of that variety of profeffions, wherein caftings of different kinds, whether in metal, wax, plafter, &c. are defiderata: we now have to offer a few remarks on fuch as appertain more particularly to the fupply of our arfenals.

The cafting of cannon, fhot, &c. was, until about half a century ago, confidered an arduous undertaking; and fo little were the fundamental principles of the art underftood, that we are affured not one in three of the fhells caft for the mortar fervice could be admitted into the ftores. Such have been the improvements made, that thoufands of articles, which ufed to be from neceffity made of wrought iron, are now to be had from the founderies at lefs than one-fifth of their former prices; while the material itfelf has been fo highly perfected, that inftances have been known of caft-iron being fufficiently foft to bear the file, and fufficiently ductile to undergo the hammer. Such, indeed, could not be done but at confiderable expence; nor does it appear that much good could refult in general. With refpect to military apparatus, it is found expedient to have the whole of our cannon, mortars, carronades, fhot, fhells, and garrifon gun-carriages, caft at the feveral founderies eftablifhed in the vicinity of coal and iron mines; whereby the work is done at comparatively a low expence, and the articles can be conveyed by water to the warren at Woolwich much under the prices at which they could be caft at the place, to which both the iron and the coals muft be tranfported.

The French have, fince the commencement of the revolution, fhewn what may be effected in this branch of military economy, by a people determined to overcome every difficulty, and to apply their refources, whether public or private, towards national purpofes. It is a well afcertained fact, that in feveral of the departments of France, from which the trains of artillery, together with the feveral ftores appertaining to them, had been withdrawn, the people fupplied their national guards with field-pieces caft in fmall temporary founderies, where the furnaces were rarely equal to heating more than from twenty to thirty pounds of bell-metal, &c. of which the facred edifices, &c. throughout the country had been ftripped. By a due combination of the whole, very ferviceable cannon, and efpecially howitzers, which feem to be a favourite fpecies of artillery among the French, were thus fupplied.

Though it muft be admitted that a foundery fuited to cafting cannon, of any defcription, could not be attached to the ordnance department of armies ferving out of the kingdom, we are inclined to hazard the opinion, that fmall laboratory furnaces, adequate to the cafting of fhot and grape, but efpecially of mufket balls, might be annexed thereto. In fome inftances, when the ftock of grape-fhot has been expended, it has become neceffary to make cafe-fhot of mufket balls, whereby the infantry have been very ill fupplied with ammunition. If, in fuch inftances, portable furnaces, and crucibles, together with proper moulds, have been at hand, (for the whole might be conveyed in a waggon, or perhaps in a cart,) abundance of refufe iron could have been formed into grape-fhot; and there would have been no fcarcity of mufket ammunition.

Nor can we fee any objection to the fupply of proper materials for eftablifhing founderies, fuited to cafting field-pieces, being fhipped with extenfive armaments proceeding on foreign fervice; fince the fpace they would occupy muft be far lefs than is required for that immenfe quantity of ftores neceffarily fent to places where no foundery exifts. Hence tonnage, time, and treafure, are often lavifhly expended. The cafting of fhot and fhells, in fuch fituations, would generally prove eafy, and liberate many a tranfport from the conveyance of fuch dead-weight, as not only precludes the fupply of other equally neceffary ftores, but, in many inftances, rifks, or even caufes, a total lofs.

FOUNDLING HOSPITAL. See *Foundling* HOSPITAL.

FOUN-HING, in *Geography*, a town of China, of the fecond rank, in the province of Fo-kien; 175 miles E.S.E. of Peking. N. lat. 26° 54'. E. long. 119° 49'.

FOUN-IM, a town of China, of the third rank, in the province of Pe-tche-li; 20 miles E. of Young-ping.

FOUNT, or FONT, among *Printers*, &c. a fet, or quantity, of characters, or letters, of each kind, caft by a letter-founder, and forted.

We fay, a founder has caft a fount of pica, of Englifh, of pearl, &c. meaning that he has caft a fet of characters of thefe kinds.

A complete fount does not only include the running letter, but alfo majufcules, or large and fmall capitals, fingle letters, double letters, points, commas, lines, borders, head-pieces, tail-pieces, and numeral characters.

Founts are large or fmall, according to the demand of the printer, who orders them by the hundred weight, or by fheets. When the printer orders a fount of five hundred, he means that the fount fhould weigh five hundred pounds. When he demands a fount of ten fheets, it is underftood, that with that fount he fhall be able to compofe ten fheets, or twenty forms, without being obliged to diftribute. The founder takes his meafures accordingly: he reckons a hundred and twenty pounds for a fheet, including the quadrates, &c. or fixty pounds for a form, which is half a fheet: not that the fheet always weighs a hundred and twenty pounds, or the form fixty pounds; on the contrary, it varies according to the fize of the form; befides, it is always fuppofed that there are letters left in the cafes.

The letter-founders have a kind of lift, or tariff, whereby they regulate their founts: the occafion of which is, that fome letters being in much more ufe, and oftener repeated, than others, their cells, or cafes, fhould be better filled and ftored, than thofe of the letters which do not return fo frequently.

Thus the *o*, and *i*, for inftance, are always in greater quantity than the *k*, or *z*.

This difference will be beft perceived from a proportional comparifon of thofe letters with themfelves, or fome others. Suppofe a fount of a hundred thoufand characters, which is a common fount: here the *a* fhould have five thoufand; the *c*, three thoufand; the *e*, eleven thoufand; the *i*, fix thoufand; the *m*, three thoufand; the *k*, only thirty; and the *x*, *y*, and *z*, not many more. But this is only to be underftood of the letters of the lower cafe; thofe of the upper cafe having other proportions, which it would be here too long to infift on.

FOUNTAIN, FONS, in *Philofophy*, a fpring, or fource, of water, rifing out of the ground.

For

For the phenomena, theory, origin, &c. of ſprings, or fountains, ſee SPRING.

Among the ancients, the fountains, or ſources of rivers, were held ſacred, and even worſhipped, as a kind of divinities.

Seneca obſerves as much, in his forty-firſt epiſtle; and Cicero, lib. iii. De Nat. Deor. cap. 20. mentions, that the Roman prieſts, and augurs, uſed, in their prayers and invocations, to call on the names of the Tyber, and other rivers, brooks, and ſprings, about Rome. And the ſeventh inſcription, in p. 94. of Gruter, has *FONTI* DIVINO ET GENIO NVMINIS *FONTIS*.

It was a point of religion, not to diſturb, or make muddy, theſe waters in waſhing or bathing. Tacitus gives an inſtance hereof in Nero, Annal. lib. xiv. cap. 22.

FOUNTAIN, or *Artificial Fountain*, in *Hydraulics*, a machine or contrivance, whereby water is violently ſpouted, or darted up; called alſo a *jet d'eau*. See JET *d'Eau*, FLUID, &c.

There are divers kinds of artificial fountains; ſome founded on the ſpring, or elaſticity, of the air; and others, on the preſſure, or weight, of the water, &c.

The ſtructure of each of theſe, being pretty and curious, and affording a good illuſtration of the doctrine of hydraulics, and pneumatics, ſhall be here explained.

The theory of fountains may be collected from the articles AIR, FLUID, &c. and other particulars relating to their ajutages, and pipes of conduct, &c. may be found under JET *d'Eau*, and *Motion of* WATER.

FOUNTAIN. *Conſtruction of an artificial Fountain, playing by the ſpring, or elaſticity of the air.*—A veſſel, proper for a reſervoir, as A B, *Plate* VI. *Hydraulics*, *fig.* 7. is provided, of metal, glaſs, or the like, ending in a ſmall neck *c*, at the top: through this neck a tube is put *c d*, traverſing the middle of the veſſel, till its lower orifice *d*, nearly, but not abſolutely, reach the bottom of the veſſel; the veſſel being firſt half filled with water. The neck is ſo contrived, as that a ſyringe, or condenſing pipe, may be ſcrewed upon the tube; by means whereof a large quantity of air may be intruded through the tube into the water, out of which it will diſengage itſelf, and emerge into the vacant part of the veſſel, and lie over the ſurface of the water C D.

Now, the water here contained being thus preſſed by the air, which is, *e. gr.* twice as denſe as the external air, and the elaſtic force of air being equal to its gravitating force; the effect will be the ſame, as if the weight of the column of air over the ſurface of the water were double that of the column preſſing in the tube; ſo that the water muſt, of neceſſity, ſpout up, through the tube, when the ſyringe is removed, with a force equal to the exceſs of preſſure of the included, above that of the external air.

FOUNTAIN. *Conſtruction of an artificial Fountain, playing by the preſſure of the water.*—Having the conveniency of a fund, or reſervoir of water, in a place conſiderably higher than that where the fountain is to be (whether that fund hath been placed there by nature, or whether it hath been raiſed for the purpoſe, by a proper engine, as a pump, ſiphon, ſpiral ſcrew, or the like): from the reſervoir lay vertical tubes, for the water to deſcend through; and to theſe vertical tubes, fit other horizontal ones, under ground, to carry the water to the place where the fountain is to play. Laſtly, from theſe horizontal tubes, erect other vertical ones, by way of ajutages, jets, or ſpouts, their altitude being much leſs than that of the tubes whereby the water was carried to the horizontal ones.

Then will the water, by the preſſure of the ſuperincumbent column, be ſpouted up at theſe jets; and that to the height or level of the water in the reſervoir; and this will be the caſe, howſoever any of the tubes be bent or incurvated. For the demonſtration, ſee FLUIDS.

Thus may water be ſpouted to any given height at pleaſure; and the tubes may be ſo proportioned as to yield any given quantity of water, in a given time; or ſeveral tubes, or the ſame fountain, may be made to yield water in any given ratio; or, laſtly, different tubes may project the water to different altitudes. Rules for all which the reader will find among the laws of FLUIDS and JETS *d'Eau*.

Theſe aerial or aquatic fountains may be applied in various manners, ſo as to exhibit various appearances; and, from theſe alone, ariſes the greateſt part of our artificial water-works. An inſtance, or two, will not be unamuſing.

FOUNTAIN *ſpouting the water in various directions.*—Suppoſe the vertical tube, or ſpout, in which the water riſes, to be A B (*Plate* VI. *Hydraulics*, *fig.* 8.) into this fit ſeveral other tubes; ſome horizontal, others oblique; ſome inclining, others reclining, as O P, M N, F L, &c.

Then, as all water retains the direction of the aperture through which it is ſpouted, that iſſuing through A will riſe perpendicularly; and that through L, H, N, P, E, will deſcribe arches of different magnitudes, and tending different ways.

Or thus: ſuppoſe the vertical tube A B, *fig.* 9. through which the water riſes, to be ſtopped at the top, as in A; and, inſtead of pipes, or jets, let it be only perforated with little holes all round, or only round half its ſurface; then will the water ſpin forth, in all directions, through the little apertures, and to a diſtance proportional to the height of the fall of the water.

And hence, if the tube A B be ſuppoſed the height of a man, and be furniſhed with an epiſtomium, or cock, at C, upon opening the cock, the ſpectators will be covered unexpectedly with a ſhower.

It muſt be here obſerved, that the diameters of the apertures by which the water is emitted, muſt be conſiderably leſs than thoſe of the tubes in which the water is brought; leſt the reſiſtance of the air, and other impediments, ſpecified under FLUID and JET *d'Eau*, break the force of the water.

FOUNTAIN *playing by the draught of the breath.*—Suppoſe A B, *fig.* 10. a glaſs, or metalline ſphere, wherein is fitted a tube C D, having a little orifice in C, and reaching almoſt to D, the bottom of the ſphere. If, now, the air be ſucked out of the tube C D, and the orifice C be immediately immerged under cold water, the water will aſcend through the tube into the ſphere.

Thus proceeding, by repeated exſuctions, till the veſſel be above half full of water; and then applying the mouth to C, and blowing air into the tube, upon removing the mouth, the water will ſpout forth.

Or, if the ſphere be put in hot water, the air, being thereby rarefied, will make the water ſpout as before.

This kind of fountain is called *Pila Heronis*, or Hero's ball, from the name of its inventor.

FOUNTAIN, *the ſtream whereof raiſes and plays a braſs ball.*—Provide a hollow braſs ball A, *fig.* 11. made of a thin plate, that its weight may not be too great for the force of the water. Let the tube B C, through which the water riſes, be exactly perpendicular to the horizon.

Then the ball, being laid in the bottom of the cup, or baſon B, will be taken up in the ſtream, and ſuſtained at a conſiderable height, as A, alternately vibrating, or playing up and down.

Hence,

"Hence, as the figure of the ball contributes nothing to its reciprocal rise and fall, any other body, not too heavy, may be substituted in lieu thereof; *e. gr.* a bird, with its wings stretched forth.

But note, that, as it is necessary the ball, when on the descent, should keep the same precise perpendicular wherein it rose (since, otherwise, it would miss the stream, and fall downright), such a fountain can only be played in a place free from wind.

Fountain *which spouts water in form of a shower.*—To the tube wherein the water is to rise, fit a spherical, or lenticular head, A B, *fig.* 12. made of a plate of metal, and perforated at the top with a great number of little holes.

The water rising with vehemence towards A B, will be there divided into innumerable little threads, and afterwards broke, and dispersed into the finest drops.

Fountain *which spreads the water in form of a table cloth.*—To the tube A B, *fig.* 13. solder two spherical segments, C and D, almost touching each other, with a screw E, to contract or amplify the interstice or chink, at pleasure.

Others chuse to make a smooth, even cleft, in a spherical or lenticular head, fitted upon the tube.

The water spouting through this chink or cleft will expand itself in manner of a cloth.

Fountains, *wherein the water spouts out of the figures of men, and other animals.*—Since water may be derived, or conveyed, by tubes in any situation, and always retains the direction of the aperture, all here required is, to inclose tubes within the figures of men, or other animals, having their orifices in those parts whence the water is intended to spout forth.

From the principles hitherto laid down, it will be very easy to deduce whatever relates to the furniture of fountains, and the various forms water may be put into by their means; all depending on the magnitude, figure, and direction, of the ajutages, or apertures.

Fountain, *which, when it has done spouting, may be turned like an hour-glass.*—Provide two vessels, A and B, *Plate* VII. *Hydraulics, fig.* 1. to be so much the bigger as the fountain is to play the longer; and placed at so much the greater distance from each other, as the water is desired to spout the higher. Let C D E be a crooked tube, furnished in E with a jet; and G H I another bent tube, furnished with a jet in I; K L and G F are to be the other lesser tubes, open at both ends, and reaching near to the bottom of the vessels B and A, to which the tubes G H and C D are likewise to reach.

If, now, the vessel A be filled with water, it will descend through the tube C D; and will spout up through the jet E, by the pressure of the column of water C D. But unless the pipe G F was open at G, to let the air run up to F, and press at the top of the surface of the water in the cavity A, the water could not run down and spout at E. After its fall again, it will sink through the little tube K L, into the vessel B, and expel the air through the tube G I. At length, when all the water is emptied out of the vessel A, by turning the machine upside down, the vessel B will be the reservoir, and make the water spout up through the jet I, the pipe K L supplying B with air to let the water descend in the direction G H I.

Hence, if the vessels A and B contain just as much water as will be spouted up in an hour's time, we shall have a spouting clepsydra or water-clock; which may be graduated, or divided, into quarters, minutes, &c. as shewn under Clepsydra.

Fountain *of Command.*—This depends on the same principles with those of the former: C A E, *fig.* 2. is a vessel of water secured against the entrance of the air, except through the pipe G F, when the cock C, by which it was filled, is shut. There is another pipe E D H B, which goes from the bottom of the water to the jet B in the bason D B, but this is stopped by the cock H. At the lowest part of the bason D B there is a small hole at I to let the water of the bason D B run into the bason G H under it; there is also a small triangular hole, or notch, in the bottom of the pipe F G at G. Turn the cock H, and the fountain will play for some time, then stop, then play again alternately for several times together. When those times of playing and stopping are known before-hand, you may command the fountain to play or stop, whence its name. The cause of this phenomenon is as follows: the water coming down the pipe E D H B, would not come out at B, if the air S s, above the water, was not supplied as it dilated; now it is supplied by the pipe G F, which takes it in at the notch G, and delivers it out at F; but after some time the water, which has spouted out at B, falling down into the bason D B, rises high enough to come above the notch G, which stops the passage of the air; so that the air S s, above the water in the vessel C A E, wanting a supply, cannot sufficiently press, and the fountain ceases playing. But when the water of D E has run down into the lower bason H G, through the hole I, till it falls below the top of the notch G, the air runs up into the upper receptacle, and supplies that at S s, and the fountain plays again. This is seen a little before-hand, by a skin of water on the notch G, before the air finds a passage, and then you may command the fountain to play. It is evident, that the hole I must be less than the hole of the jet, or else all the water would run out into the lower bason, without rising high enough to stop the notch G.

Fountain *that begins to play upon the lighting of candles, and ceases as they go out.*—Provide two cylindrical vessels, A B and C D, *fig.* 3. connect them by tubes, open at both ends, K L, B E, &c. so that the air may descend out of the higher into the lower: to the tubes solder candlesticks, H, &c. and to the hollow cover of the lower vessel, C E, fit a little tube, or jet, F G, furnished with a cock G, and reaching almost to the bottom of the vessel. In G let there be an aperture, furnished with a screw, whereby water may be poured into C D.

Then, upon lighting the candles H, &c. the air in the contiguous tubes becoming rarefied thereby, the water will begin to spout through G F.

By the same contrivance may a statue be made to shed tears upon the presence of the sun, or on the lighting of a candle, &c.: all here required being only to lay tubes from the cavity wherein the air is rarefied, to some other cavities placed near the eyes full of water.

A fountain may be made by the rarefaction of the air in the following manner: let A B and C D, *fig.* 4. be two pipes fixed to a brass head C, made to screw into a glass vessel E, which, having a little water in it, is inverted till the pipes are screwed on; then reverting it suddenly, so as to put A, the lower end of the spouting pipe A B, into a jar of water A, and the lower end of the descending pipe C D, into a receiving vessel D, the water will spout up from the jar A into the tall glass vessel E, from which it will go down at the mouth C through C D, into the vessel D, till the water is wholly emptied out of A, making a fountain in E, into D. The reason of the play of the fountain is this: the pipe C D, being two feet nine inches long, lets down a column of water which rarefies the air $\frac{1}{12}$th part in

in the veſſel E, where it preſſes againſt the water ſpouting at B with $\frac{1}{12}$th of the force by which the water is puſhed up at the hole A, by the preſſure of the common air on the water in the veſſel A; ſo that the water ſpouts up into E, when the air is rarefied $\frac{1}{12}$, with the difference of the preſſure of the atmoſphere, and the forementioned rarefied air; *i. e.* of 33 to $2\frac{3}{4}$. This would raiſe the water two feet nine inches; but the length of the pipe A, nine inches being deducted, the jet will only riſe two feet. This, ſays Deſaguliers, may be called a ſyphon fountain, where A B is the driving leg, and C D the iſſuing leg.

FOUNTAIN *of Hero of Alexandria*, ſo called, becauſe it was contrived by him. In the firſt fountain already deſcribed, the air is compreſſed by a ſyringe; in this, ſee *fig.* 5, the air, being only compreſſed by the concealed fall of water, makes a jet, which, after ſome continuance, is conſidered by the ignorant as a perpetual motion; becauſe they imagine that the ſame water which fell from the jet riſes again. The boxes C E and D Y X, being cloſe, we ſee only the baſon A B W, with a hole at W, into which the water ſpouting at B falls: but that water does not come again; for it runs down through the pipe W X into the box D Y X, from whence it drives out the air, through the aſcending pipe Y Z, into the cavity of the box C E, where, preſſing upon the water that is in it, it forces it out through the ſpouting pipe O B, as long as there is any water in C E; ſo that this whole play is only whilſt the water contained in C E, having ſpouted out, falls down through the pipe W X into the cavity D Y X. The force of the jet is proportional to the height of the pipe W X, or of the boxes C E and D Y above one another; the height of the water, meaſured from the baſon A B W to the ſurface of the water in the lower box D Y X, is always equal to the height meaſured from the top of the jet to the ſurface of the water in the middle cavity at C E. Now, ſince the ſurface C E is always falling, and the water in D Y always riſing, the height of the jet muſt continually decreaſe, till it is ſhorter by the height of the depth of the cavity C E, which is emptying, added to the depth of the cavity D Y which is always filling; and when the jet is fallen ſo low it immediately ceaſes. The air is repreſented by the points in this figure. To prepare this fountain for playing, which ſhould be done unobſerved, pour in water at W, till the cavity D X Y is filled; then invert the fountain, and the water will run from the cavity D X Y into the cavity C E, which may be known to be full, when the water runs out at B held down. Set the fountain up again, and, in order to make it play, pour in about a pint of water into the baſon A B W; and as ſoon as it has filled the pipe W X, it will begin to play, and continue as long as there is any water in C E. You may then pour back the water left in the baſon A B W, into any veſſel, and invert the fountain, which being ſet up right again, will be made to play, by putting back the water poured out into A B W; and ſo on as often as you pleaſe.

The fountain, *fig.* 6. is of the ſame kind; but having double the number of pipes and concealed cavities, it plays as high again. In order to underſtand its ſtructure, ſee *fig.* 7. The baſon is A, the four cavities are B, C, D, and E, from which the water through the pipe f G, ſpouts up to double the height of the fountain, the air at E, which drives it, being doubly condenſed. The water going down the pipe 1 (*e. gr.* three feet long), condenſes the air that goes up into the cavity C through the pipe 2, ſo as to to make it $\frac{1}{10}$ ſtronger than the common air; then the water which falling into the pipe 3 from C to D, is capable, by the height of its fall, of condenſing the air at E, ſo as to make it $\frac{1}{10}$ ſtronger, being puſhed at C by air already condenſed into $\frac{1}{10}$ leſs ſpace, cauſes the air at E to be condenſed twice as much; that is, to be $\frac{1}{5}$ ſtronger than common air; and, therefore, it will make the water at G ſpout out with twice the force, and riſe twice as high as it would do, if the fountain had been of the ſame ſtructure as the former. In playing this fountain, turn it upſide down, and taking out the plugs g, h, fill the two cavities C and E, and, having ſhut the holes again, ſet the fountain upright, and pour ſome water into the baſon A, and the jet will play out at G; but the fountain will begin to play too ſoon; and, therefore, the beſt way is to have a cock in the pipe 3, which, being open, whilſt the cavities C and E are filled, and ſhut again before the fountain is ſet up, will keep the water thrown into the baſon from going down the pipe 1, and that of the cavity C from going down the pipe 3, by which means the fountain will not play before its time, which will be as ſoon as the cock is opened.

FOUNTAIN, *Dial, of Deſaguliers*, is contrived to play by the ſpring of the air, increaſed by the heat of the ſun, and ſerves alſo for a dial at the ſame time. G N S, *fig.* 8, is a hollow globe of thin copper, eighteen inches in diameter, ſupported by a ſmall inverted baſon, reſting on a frame A B C, with four legs, between which there is a large baſon of two feet diameter. In the leg C there is a concealed pipe, proceeding from G, the bottom of the inſide of the globe, along H V, and joining an upright pipe u I, for making a jet at I. The ſhort pipe I u, going to the bottom of the baſon, has a valve at u, under the horizontal part H V, and another valve at V above it, and under the cock &. At the north pole N there is a ſcrew for opening a hole, through which the globe is ſupplied with water. When the globe is half filled, let the machine be ſet in a garden, and, as the ſun heats the copper and rarefies the included air, the air will preſs upon the water, which, deſcending through the pipe G C H V, will lift up the valve V, and ſhut the valve u, and the cock being open, ſpout out at I, and continue to do ſo for a long time, if the ſun ſhines, and the ajutage be ſmall. At night, as the air condenſes again by the cold, the outward air, preſſing into the ajutage I, will ſhut the valve N, but by its preſſure on the baſon D u H, puſh up the water, which has been played in the day-time through the valve u, and the pipe u H G into the globe, ſo as to fill it up again to the ſame height which it had at firſt, and the next ſun-ſhine will cauſe the fountain to play again, &c. The uſe of the cock is to keep the fountain from playing till you think proper: a ſmall jet will play ſix or eight hours. If the globe be ſet for the latitude of the place, and rectified before it be fixed, with the hour lines or meridians drawn upon it, the hours marked, and the countries painted upon it, as in the common globe, it will be a good dial; the ſun ſhining upon the ſame places in this globe as it does upon the earth itſelf. Deſagulier's Exper. Phil. vol. ii. lect. 9. p. 205.

FOUNTAIN, with regard to *Architecture*, is an aſſemblage of maſonry, ſculpture, &c. either for the decoration, or conveniency of a city, garden, or the like.

Fountains acquire various denominations, according to their form and ſituation: as,

FOUNTAIN, *Arched*, that whoſe baſon and jet are placed perpendicularly under the arch. Such are the fountains of the Colonade, and the triumphal water-arch at Verſailles.

FOUNTAIN, *Baſon*, is that with only a ſimple baſon of any figure whatever; in the middle whereof is a jet or ſpout, or perhaps a ſtatue, or even a group of figures.

Such was formerly the fountain in the court of Buckingham-house.

FOUNTAIN, *Covered*, a kind of pavilion, built of ſtone, either inſulate, and ſquare, or round, or multilateral, or backed; and that either, with a projecture, or indenture, incloſing a reſervoir, and ſpouting or darting forth the water thereof through one or more cocks, in the middle of a ſtreet, ſquare, garden, court, or the like. Such was that in Lincoln's-inn New Square, London.

FOUNTAIN, *Cup*, is that which, beſides a baſon, has likewiſe a cup of one ſingle piece of ſtone, or marble, ſupported on a ſhaft or pedeſtal, and receiving a jet, or ſpout, riſing out of the middle thereof.

As the fountain in the court of the Vatican, the cup whereof is of granite, and antique, being brought from the baths of Titus at Rome.

FOUNTAIN, *Marine*, that compoſed of aquatic figures, as ſea divinities, naiads, tritons, rivers, dolphins, and other fiſhes, and ſhells. Such is the fountain of the palace of Paleſtrina at Rome, where the ſhell, ſupported by four dolphins, ſerves as a cup, and ſupports a triton, that ſpouts water out of his concha marina.

FOUNTAIN, *Naval*, is that made in the form of a veſſel. Such is that of the place D'Eſpagne, at Paris, repreſenting a bark: that at Monte-Cavello, repreſenting a galley: or that before the vineyard Mattei, at Rome, reſembling a boat.

FOUNTAIN, *Open*, is any ſpouting fountain with a baſon, cup, or other ornaments, all open; ſuch as are met with frequently in our gardens, and in the vineyards at Rome.

FOUNTAIN, *Pyramidal*, that formed of ſeveral baſons, or cups, ranged in ſtories over each other, and diminiſhing all the way, being ſupported by a hollow ſtem, or ſhaft. As the fountain of Monte-Dragone at Freſcati.

Or elſe ſupported by figures, fiſhes, or conſoles; the water whereof, in its fall, makes nets in divers ſtories, and repreſents a kind of water pyramid; as that at the head of the caſcades at Verſailles.

FOUNTAIN, *Ruſtic*, is that formed, or enriched, with rock-work, ſhell-work, petrifactions, &c.

FOUNTAIN, *Satyric*, is a kind of ruſtic fountain, in the manner of a grotto, adorned with termini, maſcaroons, fauns, ſylvans, bacchantes, and other ſatyrical figures, ſerving for ornaments, as well as jets d'eau.

FOUNTAIN, *Spouting*, or *jet d'eau*, is any fountain, whoſe water is darted forth impetuouſly through one or more jets, or ajutages, and returns in form of rains, nets, folds, or the like. See JET *d'Eau*.

FOUNTAIN, *Spring*, a kind of plain ſpout, or ſtream of water, iſſuing out of ſtone, or a hole in a wall, without any decoration. Such is the fountain of Trevi at Rome.

FOUTAINN, *Statuary*, that which, being opened and inſulated, or even-backed, is adorned with one or more ſtatues, by way of finiſhing or crowning; as the fountain of Latona, at Verſailles; and that at the Shepherd at Caprarola.

There are alſo ſtatues which ſpout forth water at ſome of their parts; or at ſea-ſhells, vaſes, urns, and other attributes of the ſea.

FOUNTAIN, *Symboliсal*, that where the principal ornaments are the attributes, arms, or cognizance, of the perſon who erected it. Such are the fountain of St. Peter in Montorio, reſembling a caſtle flanked with towers, and donjons, repreſenting the arms of Caſtile; and ſome other fountains at Rome, among which are the fleur-de-lis, and the dove, the bearings of the family of pope Innocent X.

FOUNTAIN-*pen*, is a ſort of pen contrived to contain a great quantity of ink, and let it flow, by gentle degrees, ſo as to ſupply the writer a long time without the neceſſity of taking freſh ink.

The fountain-pen, repreſented *Plate* XV. *Miſcellan. fig.* 4. conſiſts of divers pieces, F, G, H, of braſs, ſilver, &c. whereof the middle piece F carries the pen, which is ſcrewed into the inſide of a little pipe; which, again, is ſoldered to another pipe of the ſame bigneſs, as the lid G; in which lid is ſoldered a male ſcrew, for ſcrewing on the cover; as alſo for ſtopping a little hole at the place, and hindering the ink from paſſing through it: at the other end of the piece F is a little pipe, on the outſide whereof the top cover H may be ſcrewed. In the cover there goes a port-craion, to be ſcrewed into the laſt-mentioned pipe, in order to ſtop the end of the pipe into which the ink is to be poured by a funnel.

To uſe the pen, the cover G muſt be taken off, and the pen a little ſhaken, to make the ink run more freely.

FOUNTAINE, *Sir* ANDREW, in *Biography*, an Engliſh antiquary, collector, and writer, was born at Norford in the county of Norfolk, and received his education at Chriſt-church college, Oxford, where he early diſtinguiſhed himſelf by his proficiency in Anglo-Saxon literature. Leaving the ſeat of the muſes to reſide on his eſtate, he erected a noble houſe, which became celebrated by the literary characters of the time, whoſe acquaintance the proprietor aſſiduouſly cultivated, and who were frequently entertained, as welcome gueſts, in his hoſpitable manſion. Among others were Swift, Addiſon, and Pope. By the latter ſir Andrew was complimented for his elegant taſte, and his reſidence continued to perpetuate a diſplay of it. Norford-hall was not only the rendezvous of living genius, but a repoſitory of arts and learning. Its owner evinced a love of the fine arts, and exhibited ſpecimens of his own attainments. The admirable deſigns for illuſtrating the Tale of a Tub he drew for Swift, with whom he was very intimate. He made a collection of choice pictures, ancient painted earthen ware, bronzes, ſtatues, coins, and numerous ſpecimens of curious antiquated remains; and ſtocked a large, handſome library with a fine ſelection of rare, valuable books and manuſcripts.

The founder of this repoſitory of the arts was made knight of the Bath by patent, during the reign of George the firſt, in 1726: and in the following year was appointed warden of the mint. He died in 1753. His treatiſe, entitled "Numiſmata Anglo-Saxonica, et Anglo-Danica, breviter illuſtrata," was printed in Hickes's Theſaurus, at Oxford, in 1704. Gen. Biog. Dict. and Blomefield's Hiſtory of Norfolk.

FOU-PIM, in *Geography*, a town of China, in the province of Pe-tche-li; 63 miles W. of Paoting.

FOU-PIN, a town of China, of the third rank, in the province of Quang-tong; 12 miles S.E. of Yao.

FOUQUIERES, JAMES, in *Biography*, a landſcape painter, born at Antwerp in 1580. He ſoon quitted the ſtyle of Brughel, under whom he early in life ſtudied, and reſiding ſome time at Rome and Venice, imbibed a taſte for a more exalted view of nature, and mode of imitating her productions.

He ſtudied the works of Titian, and obtained very much of his grand ſtyle of compoſition and execution, though in the latter he was more ſharp, and had more of what

what among artifts is peculiarly denominated manner of touch, than his prototype, that great mafter of art.

Fouquieres was an excellent painter, and defervedly gained a great reputation. He painted both in a large and fmall ftyle equally well, with a beautiful tafte in arrangement and effect, and with great force. Sometimes his colour is too green to be perfect, but in general it is very rich and pleafing.

He was engaged and much careffed at the court of the elector Palatine, and afterwards fpent feveral years of his life in France, where his works met with univerfal approbation, and he was proportionally well paid for his paintings. Unhappily he funk at laft into poverty, and died in the year 1659 in the houfe of an inconfiderable painter named Silvain, who lived in the fuburbs of Paris.

FOUR Brothers, in *Geography*, four fmall iflands in the Eaft Indian fea. S. lat. 6° 54'. E. long. 115° 22'.

Four *Corners*, in the *Manege*, or to work upon the four corners, is to divide in imagination the volt or round into four quarters; fo that, upon each of thefe quarters, the horfe makes a round or two at trot or gallop: and when he has done fo upon each quarter, he has made the four-corners.

Four, *Cul de four*. See Cul.

Four *Evangelifts*, in *Geography*. See Evangelists.

Four *Iflands*, a clufter of fmall iflands in the Pacific ocean, fo called by lieutenant Shortland. S. lat. 4° 50'. E. long. 155° 36'.

Four *Keys*, fmall iflands in the bay of Honduras. N. lat. 17 12'. W. long. 87° 55'.

Four *Mile Water*, a river of Ireland, which runs into Dunmannus bay, five miles S.W. of Bantry.

Four *Mile Creek*, a river of Kentucky, in America, which runs into the Ohio. N. lat. 36° 50'. W. long. 89° 30'.—Alfo, a river of Virginia, which runs into the Potomack. N. lat. 38° 56'. W. long. 77° 13'.

Four *Saddle Ifland*, an ifland in the Mergui Archipelago, about fix miles in circumference, feparated by Alderfey's ftraits from the fouthern extremity of the ifland of St. Sufanna. N. lat. 10° 27'.

FOURCA, a town of Africa, in the kingdom of Hoval; 35 miles W. of Ender.

FOURCES, a town of France, in the department of the Gers; fix miles W.N.W. of Condom.

FOURCHE, a river of North America, which runs into lake Michigan. N. lat. 44° 31'. W. long. 86° 38'.

FOURCHEE, or Fourchy, in *Heraldry*, denotes a crofs forked at the ends.

Upton rather reprefents it as anchored, the extremities turning in a circular manner to fharp points; whereas the true crofs fourchee, *i. e.* forked, has its forks compofed of ftraight lines, and blunt ends.

FOURCHER, or Fourchir, Fr. an ancient law term, fignifying a putting off, prolonging, or delaying an action.

As by ftammering we draw out our fpeech, not delivering that we have to fay in ordinary time; fo by fourching we prolong a fuit that might be ended in a fhorter fpace.

In ftat. Weftm. I. cap. 42. we have thefe words: "Coparceners and joint-tenants fhall be no more fourch, but only fhall have one effoin," &c. And anno 6 Edw. I. cap. 10. it is ufed in the fame fenfe: "The defendants fhall be put to anfwer without fourching," &c. In the Latin it is called *furcare*, and is ufed where a man and his wife do effoin feverally. "Caveat vir & mulier implacitati, quod femper in effonio alterius alter compareat, quamdiu furcare poffint; & cum ultra non poffint, concurrant coram effonio in fuis locis: alter autem earum tantum unam effonium de malo lecti habere poteft." Hengham Mag. cap. 9.

FOURCHES, in *Geography*, a chain of mountains in Switzerland, at the eaftern extremity of the Valais, in which the Rhone rifes.

FOURCHETTE. *Fer de* Fourchette. See Fer.

FOURDAN-HOTUN, in *Geography*, a town of Corea, 653 miles E.N.E. of Peking. N. lat. 42° 51'. E. long. 131° 20'.

FOURMILLIER, in *Zoology*, the name given by Buffon to the *myrmecophaga didactyla* of Linnæus, or the little ant-eater; or leffer yellowifh *tamandua*; or the white American *coati*. See Myrmecophaga.

FOURMONT, Stephen, in *Biography*, diftinguifhed for his knowledge of languages, was born, 1683, in the neighbourhood of Paris. He had the misfortune to be early deprived of his parents, but his uncle placed him at the Mazarin college in Paris, where he quickly acquired a thorough knowledge of the Greek and Latin tongues. While a ftudent he publifhed "The roots of the Latin language put into French verfe," which was not only well received by the public, but immediately adopted as a fchool book in various places of education. In connection with theological and philofophical fubjects, he began the ftudy of the oriental languages. In the college of the Trente-fois, he formed, in conjunction with the abbé Sevin, a fociety of young ecclefiaftics, ardent in literary purfuits, to read privately together the Greek and Latin poets, for which the leaders were expelled. Fourmont removed to the college of Montaigu, where he had the felicity of occupying the fame apartment in which Erafmus once lived, a circumftance which increafed his ardour for ftudy. He gave a tranflation of Aben Ezra's Commentary on Ecclefiaftes, which increafed his reputation as an orientalift. He was, after this, admitted an advocate, but never practifed in that profeffion. He was invited to Spain by the count de Toledo, who procured for him a penfion from the Spanifh court, though he could not prevail upon Fourmont to leave his country. In 1715 he was appointed Arabic profeffor in the royal college, and an affociate in the academy of infcriptions and belles lettres; he gave public lectures in the Hebrew language, and put the Hebrew, Syriac, and Arabic roots into French verfe. He beftowed much labour in attaining a knowledge of the Chinefe language; and engaged in the difpute concerning Homer and the ancients which then divided the French literati. He was regarded by foreigners as well as by his own countrymen as an oracle in oriental learning, and was elected a member of the London and Berlin royal focieties. He died in the year 1745, leaving behind him many works that teftify to his talents, his induftry and learning; among thefe are "Reflexions critiques fur les Hiftoires des anciens Peuples jufqu'au Tems de Cyrus," in two vols. 4to. "A Chinefe grammar in Latin," folio. Moreri.

FOURNELS, in *Geography*, a town of France, in the department of Lozère, and chief place of a canton in the diftrict of Marvejols. The place contains 571, and the canton 5932 inhabitants, in a territory of 197½ kiliometres, and 11 communes.

FOURNIER, Peter Simon, in *Biography*, an eminent engraver and letter founder, born at Paris in 1712, excelled in the practice of the typographical art, and illuftrated it by his writings. He wrote feveral treatifes on the origin and progrefs of his favourite art, which were collected in one volume 8vo. divided into three portions, of which the laft contained a curious hiftory of engravers in wood; but his moft confiderable production is entitled "Manuel Typo-

Typographique," in two vols. 8vo. defigned as well for general readers as for the inftruction of artifts. He died in 1768; he was a man of great piety, fond of retirement, and extremely induftrious.

FOURNIS, in *Geography*, a town of the ifland of Samos; two miles N.E. of Carlovaffi.

FOURNO, a town of Afiatic Turkey, in Caramania; 104 miles W.S.W. of Satalia.

FOURS, a town of France, in the department of the Niévre, and chief place of a canton in the diftrict of Nevers. The place contains 800, and the canton 8222 inhabitants, on a territory of 382½ kiliometres, and in 13 communes.

FOURTEENTH, in *Mufic*, is the replicate or octave of the feventh; the major fourteenth has a ratio of $\frac{4}{15} = 1167\,\Sigma + 23f + 101\,m$; the greater minor fourteenth of fome is $= \frac{5}{18} = 1131\,\Sigma + 22f + 98\,m$, and the leaft minor fourteenth $= \frac{9}{32} = 1120\,\Sigma + 22f + 97\,m$.

FOURTH, one of the harmonic intervals or concords.

The fourth is the fourth in order of the concords. It confifts in the mixture of two founds, which are in the ratio of 4 to 3; *i. e.* of founds produced by chords, whofe length are to each other as 4 : 3.

It is called fourth, becaufe containing four terms, or founds, between its extremes, and three degrees; or, as being the fourth in the order of the natural fcale, from the fundamental.

Some modern muficians have doubted whether the fourth fhould be received among the number of concords, or not. The ancients exprefsly admitted it as fuch, and Andreas Papius wrote a treatife againft thofe moderns who reject it. Merfen. Harm. lib. iv. prop. 8. Wallis, Append. Ptolem. Harm. p. 182. Indeed the ancients always regarded it as a concord of the moft perfect kind. Its terms were the boundaries of all the tetrachordal fyftems; and though ranked as a difcord by feveral moderns in counterpoint, it is ftill a mathematical confonance in the divifion of the monochord; and even in counterpoint, as an inverfion of the fifth $\begin{smallmatrix}C\\G\\C\end{smallmatrix}$; nor can a common chord in triad be played in its firft ftage without a fourth in its compofition $\begin{smallmatrix}C\\G\\E\\C\end{smallmatrix}$. When accompanied by the fifth it is certainly a difcord, and fo is the third accompanied by the fourth, the fifth by the fixth, &c. Dr. Pepufch and Padre Martini clafs the fourth among perfect concords, and fo do all theorifts who have dipt into the mufic of the ancients, or mathematics.

N. B. Examples of the ufe of the fourth, in three and four parts, will be given in notation upon one of the mufic plates.

This is the interval which the ancients called diatesfaron or tetrachord: it is the complement of the fifth, and partakes much of its fweetnefs of harmony; it confifts of five of the half-notes of keyed inftruments which have 12 founds in the octave. It is ufually marked fourth in the works of thofe who treat of mufical intervals, and it is the largeft of the three concordant elements: its ratio is $\frac{3}{4} = \frac{3}{2^2}$, and in Mr. Farey's new notation is expreffed by $254\,\Sigma + 5f + 22\,m$: its common logarithm is .8750612,6339, and its binary or Euler's logarithm .415038 (wherein the octave $= 1$); it is $= 23.158110$ major commas: it is alfo the fum of a major, a minor, and a major femi-tone, is equal to two tones and a limma, to a minor third and minor tone, a major third and a major femi-tone, to a major tone, two limmas, and an apotome, and is a medius femi-tone lefs than the tritone. Befides the above, feveral other intervals bear the names of fourth, as

FOURTH, *Flat*, the diminifhed fourth of Tartini, or diefis-exceffive major third; it is lefs than a true fourth by the minor femi-tone, and confifts of four half-notes; its ratio is $\frac{25}{32} = 218\,\Sigma + 4f + 19\,m = \frac{5^2}{2^5}$; its common logarithm is .8927900,3035, and its binary log. $=$ .356143; it contains 19.87198 major commas, and confifts of a major third and an enharmonic diefis, a minor third and a major femitone, a major tone and two major femi-tones; it is the excefs of a major third over a minor third and minor fourth, and of an octave over two major thirds; by either of which laft it may be tuned on an organ.

FOURTH, *Sharp*, the fuperfluous or greater fourth of fome, or deficient tritone, is greater than a true fourth by the minor femitone, and confifts of fix half-notes; its ratio is $\frac{18}{25} = \frac{2\,.\,3^2}{5^2} = 290\,\Sigma + 6f + 25\,m$, its common logarithm is .8573324,9643, and its binary log. $=$ .473932; it contains 24.44423 major commas, and confifts of a major and two minor tones; it is the difference between three major tones and two major commas, of a tritone and major comma, of a minor third and the fum of a major third and minor fourth, and of a minor third and major fixth, whence it may be tuned.

FOURTH, *Greateft Sharp*, or redundant fharp fourth, the tritone, falfe fourth, or tritonus of fome, exceeds a true fourth by the medius femi-tone; its ratio is $\frac{32}{45} = \frac{2^5}{3^2 5} = 301\,\Sigma + 6f + 26\,m$: its common logarithm is .85 9374,6454, and its binary log. .49 851; it is 27.44423 major commas: it is equal to two major and one minor tones, to a major third and major tone, to the difference between a fifth and a major femi-tone, or three tones and a major comma; it is alfo the difference between a fourth, and two major and one minor third, or between a minor fourth and a fifth and major third, whence it may be tuned.

FOURTH, *Greateft Sharp*, or double redundant fharp fourth, the tritonus of the Greek fcale, or ancient, or redundant, or fuperfluous tritone of fome, is larger than a true fourth by the apotome; its ratio is $\frac{512}{729} = \frac{2^9}{3^6} = 312\,\Sigma + 6f + 27\,m$; its common logarithm is .8465424,3266, and its binary log. 509772: it is 28.44423 major commas, and confifts of three major tones, or of three apotomes and three limmas: it is the difference between a fifth and a limma; between fix fifths and three octaves, or between three fifths and three fourths, whence it can be tuned.

FOURTH, *Leffer Flat*, or deficient flat fourth, is lefs than a true fourth by the medius femi-tone; its ratio is $\frac{405}{512} = \frac{3^4 5}{2^9} = 207\,\Sigma + 4f + 18\,m$: its common logarithm is .8981850,6224, and its binary log. .338224: it is 18.87198 major commas: it is equal to a minor tone and two major femi-tones, to a minor third and a limma, to a major third and a minor comma; to a major tone, a major femi-tone, and a limma: it is alfo the difference between three 4ths and

and two major and one minor thirds, whence it may be tuned.

Fourth, *Leaſt Flat*, or double deficient flat fourth, is an apotome leſs than a true fourth, its ratio is $\frac{6561}{8192} = \frac{3^8}{2^{13}} = 196\ \Sigma + 4\,f + 17\ m$; its common logarithm is .9035800,9412, and its binary log. = .320303; it is 17.87198 major commas; it is equal to a major tone and two limmas, to an apotome and three limmas; it is the difference between a major third and a ſchiſma, alſo between five octaves and eight fifths, or five fourths and three fifths, whence it may be tuned.

Fourth, *Comma-deficient*, the deficient fourth, or the leſſer fourth of Holder, is a comma leſs than a true fourth, as its name imports; its ratio is $\frac{243}{320} = \frac{3^5}{2^6\,5} = 243\ \Sigma + 5\,f + 21m$; its common logarithm is .8804562,9528, and its binary log. = .397117; it is 22.15811 major commas, and conſiſts of two minor tones and a major ſemitone; of a major third and a limma; and is the difference between three fourths and two minor and one major thirds, whence it can be tuned.

Fourth, *Comma-redundant*, the redundant fourth, the greater fourth of Holder, and the ſuperfluous fourth of Galileo, exceeds a true fourth by the major comma; its ratio is $\frac{20}{27} = \frac{2^2\,5}{3^3} = 265\ \Sigma + 5\,f + 23\ m$; its common logarithm is .8690662.3150, and its binary log. = .432958: it is 24.15811 major commas, and is equal to two major tones, and a major ſemitone, to a minor third and a major tone; it is the difference between two minor and one major thirds and a fourth, alſo between two fifths and a major ſixth, whence it may be tuned.

Fourth, *Diaſchiſma-exceſſive*, exceeds a true fourth by the diaſchiſma, being the reſulting fourth, or that between the *bearing notes*, when eleven ſucceſſive perfect fourths (or 11 fifths) are tuned in an octave: its ratio is $\frac{131072}{177147} = \frac{2^{17}}{3^{11}} = 266\ \Sigma + 5\,f + 23\ m$; its common logarithm is .8691761,2437, and its binary log. = .434583; it is 24.24895 major commas, is equal to two major tones and an apotome, to three apotomes and two limmas: it is the difference between a fifth and two limmas, between 11 fifths and ſix octaves, between five octaves and 11 fourths, or between five fifths and ſix fourths; whence it may be tuned.

Fourth, *Extreme diminiſhed*, the enharmonic leſſer third of ſome, is two minor ſemitones ſmaller than a true fourth, and an enharmonic dieſis greater than a minor third; its ratio is $\frac{625}{768} = \frac{5^4}{2^8\,3} = 182\ \Sigma + 3\,f + 16\ m$: its common logarithm is .9105187,9731, and its binary logarithm .297249; it is 16.58587 major commas, and is equal to three major ſemitones and a major comma, to a major and a minor tone and an enharmonic dieſis: it is the difference between a minor fourth with two major thirds, and two minor thirds, or between a major twelfth and four major thirds, and hence it may be tuned on an organ.

Fourth *Point, Arches of the.* See Arch.

Fourth *Rate.* See Rate.

FOUSSERAT, in *Geography*, a town of France, in the department of the Upper Garonne, and chief place of a canton in the diſtrict of Murat; 29 miles S.W. of Toulouſe. The place contains 2,100, and the canton 7,857 inhabitants, on a territory of $187\frac{1}{2}$ kiliometres, in 18 communes.

FOU-TCHEOU, a city of China, of the firſt rank, in the province of Fo-kien, and one of the moſt conſiderable cities in the province; diſtinguiſhed by the beauty of its ſituation, the trade it carries on, the number of its learned men, and the convenience of its rivers and port; and particularly by the magnificence of its principal bridge, which has more than 100 arches, conſtructed of white ſtone, and ornamented throughout with a double baluſtrade. This city is the reſidence of a viceroy, and has under its juriſdiction nine cities of the third claſs; 870 miles S. of Peking. N. lat. 26° 4′. E. long. 119° 4′.

Fou-tcheou, or *Vou-tcheou*, a city of China, of the firſt rank, in the province of Kiang-ſi, and formerly one of the moſt beautiful cities in China; but ſince the invaſion of the Tartars it has been a heap of ruins, conveying ſtill ſome idea of its ancient magnificence. The air is pure, the people are active and induſtrious, and the adjacent fields well cultivated. Its diſtrict is about 25 leagues in extent; and belonging to it are ſix cities of the third claſs.

FOU-TCHING-Y, a town of China, in the province of Kiang-nan; 17 miles N.E. of Liu-tcheou.

FOU-TCHUEN, a town of China, in the province of Chan-ſi; 35 miles E.N.E. of Ping-lo.

FOU-TSING, a town of China, of the third claſs, in the province of Fo-kien; 17 miles S.S.E. of Fou-tcheou.

FOUX, Cape, a cape on the N.W. coaſt of the iſland of Hiſpaniola. N. lat. 19° 46′. W. long. 74° 14′.

FOU-YANG, a town of China, of the third rank, in the province of Tche-kiang; 31 miles N.N.E. of Yen-tcheou.

FOUYU, a town of the kingdom of Corea; 16 miles N. of Hetſin.

FOWEY, or Fawey, a borough, market, and ſea-port town, in the hundred of Poweter, and county of Cornwall, is ſituated on the weſtern banks of the river Fawey, which here expanding its waters into a ſpacious eſtuary, forms a ſecure harbour, capable of receiving veſſels of a thouſand tons burthen at all ſtates of tide. This is a place of conſiderable antiquity, and made a diſtinguiſhed figure in a maritime and commercial view at ſeveral periods of our hiſtory. Leland informs us, that, ſubſequent to the conqueſt, it belonged to one Caridinham, a perſon celebrated in his day, who beſtowed it on a priory, ſaid to have been founded by him, near Tywardreth, at which time it was a ſmall fiſhing town. It owed its proſperity originally to the wars between the Engliſh and French; afterwards to an extenſive piratical ſyſtem; and at length flouriſhed by the more honourable means of commerce. This place was conſpicuous in the reigns of king Edward the Firſt and Third. In the time of the latter the veſſels of this port, failing by Rye and Winchelſea, and refuſing the demanded curteſy to thoſe havens, engaged the armed veſſels ſent to enforce it, which having defeated, the place in future, as a memorial of this event, quartered the arms of thoſe towns with its own armorial inſignia. In the reign of Edward the Fourth, after a peace had been concluded between this country and France, "the *gallants* of Fowey," as they were then termed, ſtill kept their ſhips in a warlike condition, and, in deſpite of the royal mandate to the contrary, carried on hoſtilities againſt the French; for which offence the veſſels belonging to this port were ſeized, and their commanders ſent priſoners to London. This induced the inhabitants to turn their attention from martial to commercial ſpeculations. In return for its devaſtations on the coaſt of France, Fowey received frequent hoſtile viſits from the French. For its defence in the time of Henry the Fourth, two ſquare baſtion

forts were erected with port-holes for mounting of cannon, the remains of which ftand on each fide the entrance to the harbour. As an additional fecurity alfo, a large chain extended from fort to fort. Sir Thomas Treffry, in the time of Henry the Sixth, embattled and fortified his houfe, and erected a ftrong additional tower, and thus converted it into a formidable caftellated manfion. This, called *place*, though in a dilapidated ftate, is worthy of notice from its antiquity, ftyle of architecture, and ornamental fculpture. During the civil wars this and the adjacent towns were occupied by the parliamentarians, under the command of the earl of Effex, where he was fo hard preffed, and furrounded by the king's troops, as to be driven to the difgraceful expedient of abandoning the army to its fate, while he, the lord Roberts, and a few other officers made their efcape, by embarking in a fmall veffel at Fowey, which conveyed them to Plymouth.

The houfes of the prefent town are in general conftructed of ftone, and extend for about a mile along the fide of the river; but the ftreets are fo inconveniently narrow and irregular, that fcarcely carriages of any defcription can pafs through them. The church is a handfome edifice with a tower at the weft end, decorated with many carved ornaments, and ftrengthened by buttreffes at the angles, terminating in purfled pinnacles. The roof is embellifhed with angels carved in wood, fuftaining armorial fhields, and various other devices; and fome of the pews are ornamented in a fimilar manner.

The market houfe is large and fpacious, over which a neat town hall was erected a few years ago, at the expence of Philip Rafhleigh, and lord vifcount Valletort, at that time the parliamentary reprefentatives of the borough. The charitable eftablifhments are two free fchools, an almfhoufe for eight decayed widows, and an excellent poorhoufe. Fowey is governed by a corporation, confifting of a mayor, eight aldermen, a recorder, and two affiftants; of which the mayor and aldermen are juftices of the peace. It is a feudal tenure, held under the prince of Wales as part of his duchy of Cornwall, and firft fent two members to parliament, the fourteenth year of Edward the Third, but the following year the privilege was difcontinued, and the franchife not reftored till the thirteenth of Elizabeth. The right of election, twice contefted in one feffions, appears to refide in the prince's tenants, admitted to fealty and homage, and in all the inhabitants who pay fcot and lot. Here are a well fupplied weekly market on Saturdays, and three annual fairs. According to the returns made under the population act in 1801, the number of houfes was 213, containing 1155 inhabitants.

Fowey, by a late traveller, has properly been denominated "a colony of fifhermen;" for moft perfons here are either directly or remotely connected with the *pilchard* fifhery, in which concern many veffels belonging to the town are ufually employed. At the feafon when the annual fhoal of pilchards is expected, a number of watchmen, called *huers*, are ftationed on the neighbouring rocks, to obferve and give notice to the fifhermen of the courfe and direction taken by the fifh: fmall fail-boats are alfo difpofed of along the coaft for the fame purpofe. It is eftimated, that, on an average every feafon, upwards of 28,000 hogfheads of fifh are caught and brought into this port. The refufe of the falt and broken fifh are generally fold for agricultural purpofes, at about half a guinea per cart load. During other parts of the year, numerous trawl-boats are occupied in taking divers kinds of white fifh, and fome of the inhabitants find employ in the tin mines of the vicinity. The harbour is now defended by two fmall batteries, recently erected, and St. Catherine's fort, built by the townfmen in the reign of Henry the Eighth, which is fituated on the fummit of a magnificent pile of rocks, that bound one fide of the river. Thefe rocks are compofed of a hard blueifh flate, containing veins of a fubftance, which, from the greafinefs to the touch, is denominated by mineralogifts *fat quartz*. Thofe on the Polruan fide are extremely rude and bold, and, with the ruins of a chapel, form highly picturefque fcenery. See Leland's Itinerary. Polwhele's Hiftory of Cornwall. Beauties of England and Wales.

FOWL, in a general fenfe, is of equal import with bird.

Fowl is, in a more peculiar manner, underftood of poultry, or the larger fort of birds, both domeftic and wild, either bred up, or hunted, for the table.

Such as turkies, geefe, cocks, hens, and ducks, both wild and tame, pheafants, partridges, pigeons, fnipes, &c. See Poultry.

Though birds of this fort can only afford profit under particular circumftances, and in fituations that are adapted to them, the farm yard cannot be faid to be properly ftocked unlefs they are found in it. They are befides, in many cafes, extremely convenient in affording eggs and feathers, as well as in the young brood. They are generally the moft profitable on farms of the arable kind, where grain muft be unavoidably fcattered, and near large market towns, where they can be readily difpofed of at good prices. In choofing ftock of this fort, young hens are to be preferred where eggs are wanted, and old ones, where chickens are the chief objects of the farmer. Some forts of hens are much better layers and breeders than others, which fhould always, of courfe, be chofen. They may be fet from two years old to five, with moft advantage, and from the beginning of February to near Michaelmas. They fit about three weeks in general, and fhould be well fupplied with meat, water, and fand, during the time, that they may not leave their eggs too long, in feeking them. One male bird is fufficient for ten or twelve females.

Breeding and laying fowls fhould be kept well, but not by any means fo as to be fat. They may be fed with any fort of grain or feeds; but where their food is buckwheat, hemp, canary, or other feeds of a fimilar kind, they are faid to lay the beft. Animal fubftances are likewife afferted to make them lay earlier than ufual.

In fattening fowls, the common food is moftly fome fort of grain, or barley meal moiftened with milk; but fome prefer wheat flour mixed with fteamed potatoes, and others buck-wheat ground into flour and made into a fort of pafte with milk. They require to be carefully and regularly fed during the time they are fattening.

It is neceffary, in order to derive the greateft poffible profit from fowls, to have a proper houfe, and fmall inclofure fet apart for their reception, contiguous to the farm yard, into which they fhould conftantly have free accefs. They fhould in addition be regularly fed once or twice in the day in the houfe, and kept fufficiently warm during the fevere weather in the winter feafon.

Turkeys require care at the time of their hatching, and while the brood is young, but are afterwards equally hardy with the common fowl. See Turkey and Poultry.

Geefe and ducks are fowls of the water kind, which require but little care where they have large ponds or other waters to feed and fwim upon. They will however require to be fed in the fevere winter months with fome fort of grain, or other kinds of food. Geefe and ducks that are fome years old are the beft for breeding from, and one male bird is fufficient for feveral females.

The lighteſt coloured geeſe are the beſt, and thoſe that begin to lay the ſooneſt; as they have a chance of hatching twice in one year. They begin to lay in the ſpring, and lay twelve or ſixteen eggs. Green geeſe are begun to be fattened at a month old, and will be fattened in a month more. Old geeſe are chiefly fattened at ſix months old, in or after the harveſt. A wild gooſe, if red-footed and hairy, is old; but if white-footed, and not hairy, ſhe is young. See Goose and Poultry.

When the eggs are ſet under a hen, or other fowl, it is adviſeable to mark the upper ſides thereof: and when ſhe goes to feed, to note whether ſhe minds to turn them upſide down or not; if ſhe neglect that office it may be done for her.

The *Sea-fowls*, which come on ſhore in immenſe numbers to rooſt in the north iſlands of Scotland, ſet their watches and centinels at diſtant poſts, to give them notice of any danger; on the leaſt alarm from theſe, the whole body riſes, but without ſuch notice they are not to be alarmed by almoſt any thing. The people of the country know this; and when they go out to take them, they employ all their art to take the centinels without noiſe; this they ſometimes ſucceed in, and when they do, they often afterwards catch three hundred of the others, or more, in one night. Phil. Tranſ. N° 233.

The laying of theſe ſea-birds is leſs certain as to time than might be imagined. They can occaſionally defer it; and as they uſually lay in a rainy ſeaſon, if the rain does not come on at the uſual time, they will defer it ſome weeks; and if the April moon goes far in May, that alſo has been obſerved to hinder them from laying ten or twelve days longer than ordinary. See Bird.

Water-fowl may be taken in great abundance by nets properly managed. The net for this purpoſe ſhould be always made of the ſmalleſt and ſtrongeſt packthread that can be got. The meſhes may be large, but the nets ſhould be lined on both ſides with other ſmaller nets, every meſh of which is to be about an inch and a half ſquare each way, that as the fowl ſtrike either through them or againſt them, the ſmaller may paſs through the great meſhes, and ſo ſtraighten and entangle the fowl.

Theſe nets are to be pitched for every evening flight of fowl, about an hour before ſun-ſet, ſtaking them on each ſide of the river, about half a foot within the water, the lower ſide of the net being ſo plummed, that it may ſink ſo far and no farther; place the upper ſide of the net ſlantwiſe, ſhoaling againſt the water, but not touching it by near two feet; and let the ſtrings, which ſupport this upper ſide of the net, be faſtened to ſmall yielding ſticks ſet in the bank; theſe, as the fowl ſtrikes, will give the net liberty to play, and to entangle them. Several of theſe nets ſhould be placed at once over different parts of the river, at about twelve ſcore fathom diſtance one from another: and if any fowl come that way, the ſportſman will have a ſhare of them. It is a good method, when the nets are ſet, to go to places ſufficiently diſtant from them with a gun, to frighten them toward the places where the nets are; and wherever any of the fowl are ſtarted from, it may not be amiſs to plant ſome nets alſo there, to take them as they return. The nets are to be left thus placed all night, and in the morning the ſportſman is to go and ſee what is caught; he ſhould viſit the river firſt, and take up what are caught there, and frightening the reſt away to the other places where his nets are, he is next to viſit them, and take what are there ſecured.

The Ceyloneſe have great plenty of water-fowl wild on their iſland, and have a very remarkable way of catching them, which is this: the fowler enters a lake or other water which has a good bottom, and is not very deep; he puts an earthen pot upon his head, in which there are bored holes, through which he can ſee; he keeps himſelf ſo bent down in the water, that only the pot is above the ſurface; in this manner he enters the place where the wild fowl are in cluſters, and they think it is only ſome floating block. He then takes ſome one by the legs, and gently draws it under water, and wrings its neck till he has killed it; then putting it into his bag, which is faſtened about his middle, he takes hold of another in the ſame manner, and ſo on, till he has got as many as he can carry off, and then he goes back in the ſame manner in which he came, not diſturbing the reſt of the birds, who never miſs their companions, but only ſuppoſe that they dive down for their diverſion, when the fowler pulls them under. In places where this has been practiſed ſo long or ſo careleſsly, that the birds are ſhy, the fowler uſes a gun; but this he does in the following manner: he makes a ſcreen of about five feet high, and three feet wide, which he carries in one hand ſtraight between himſelf and his game, and in the other hand his gun. The birds are not alarmed at what appears only a buſh; for this ſcreen is always covered with branches of trees freſh cut down, and full of leaves, ſo that the ſportſman behind advances as near as he pleaſes, and then putting the gun through ſome crevice of the ſcreen, he fires. See Decoy. See alſo Bird-*Catching*.

Fowl *Dung*, the dung of all ſorts of domeſtic birds, which is ſaid to be excellent as a top-dreſſing, when ſown over young corn crops by the hand. See Top-*dreſſing*.

Fowl *Manure*, that ſort which is afforded by fowls. See Manure.

Fowl, *Wild, driving of*. See Driving.

FOWLER, Edward, in *Biography*, was born in the year 1632, at Weſterleigh, in Glouceſterſhire, of which place his father was miniſter, till he was ejected by the act of uniformity. Having been well grounded in the elementary parts of learning, he obtained the appointment of one of the clerks to Corpus Chriſti college, in the univerſity of Oxford. In 1653 he was choſen one of the chaplains of the inſtitution, and ſoon after took his degree of bachelor of arts. At Trinity college, Cambridge, he took the degree of maſter of arts, and was incorporated in the ſame degree at Oxford, in the year 1656. He was preſented about this period with the rectory of Northill, in Bedfordſhire, but as he had been educated in Preſbyterian principles, he ſcrupled, at firſt, to comply with the terms of conformity, eſtabliſhed at the reſtoration of Charles II.; his views being, however, changed, he was admitted a clergyman of the church of England, to which he ſteadily adhered to the end of his life. In the year 1673 he was introduced by archbiſhop Sheldon to the living of All-hallows, Bread-ſtreet, London: and ſoon after he was preſented with a prebend in the cathedral church of Glouceſter; and with the vicarage of St. Giles's, Cripplegate. In 1681 he accumulated the degrees of bachelor and doctor of divinity in the univerſity of Oxford. Dr. Fowler poſſeſſed a mind much too liberal for the times in which he lived. He was proſecuted and ſuſpended by the inſtruments of James II.'s tyranny, under pretence of having tranſgreſſed the canons of the church. He was not to be intimidated by the infliction of illegal puniſhments: he ſtill reſiſted the unconſtitutional attempts of king James to extend the regal prerogative by aſſuming a power to diſpenſe with the exiſting laws; and was the ſecond perſon who, in 1688, ſigned a reſolution entered into by the London clergy, not to read the king's new declaration for liberty of conſcience. This reſolution was

was taken in oppofition to the king's affumption of a difpenfing power, which tended to the fubverfion of the conftitution, and to inveft him with arbitrary authority. The clergy in this caufe were fupported by all the confiftent friends of liberty among the diffenters, and in the eftablifhment. When the new government was fettled, Dr. Fowler's learning and zeal were not forgotten: he was in 1691 nominated to the fee of Gloucefter, in which fituation he remained, difcharging with exemplary affiduity the duties of his bifhopric until he was difabled by his growing infirmities. He died at Chelfea, near London, in 1714, in the eighty-fecond year of his age. He had been a great writer, but his works being chiefly of the controverfial kind, it would be of little ufe to enumerate them here, fince almoft all the fubjects then in difpute have long fince been laid at reft. One of the principal of the bifhop's works, and which reflects much credit on his underftanding and memory, was entitled, "The Defign of Chriftianity, or a plain demonftration and improvement of this propofition, *viz.* that the enduing men with inward, real righteoufnefs, or true holinefs, was the ultimate end of our Saviour's coming into the world, and is the great intendment of his bleffed gofpel." Biog. Brit.

Fowler, Thomas, was born at York on the 22d of January, 1736, and, after having gone through a courfe of claffical and medical education, he engaged in the practice of pharmacy, in his native city, in the year 1760. In 1774, however, he relinquifhed this branch of practice, in order to apply himfelf more clofely to the ftudy of medical fcience; and for this purpofe he went to Edinburgh, where he graduated in 1778. He then fettled at Stafford, and was foon after elected phyfician to the infirmary at that place, where he practifed with confiderable reputation and fuccefs until the year 1791, when he returned to his native city. Here he met with the moft flattering encouragement in the exercife of his profeffion: but his ardent attention to his profeffional duties and ftudies was confiderably interrupted, in July 1793, by an attack of a painful, anomalous difeafe of the cheft, which he defcribed as "fits of fpafmodic afthma, attended with moft of the painful fymptoms of the angina pectoris." After confulting many eminent phyficians, and trying a variety of medicines, with partial and tranfient relief, for two years, he was agreeably furprifed by a fpontaneous and gradual decline of the fymptoms, and was at length totally free from them. Notwithftanding the check to his exertions which he received from this complaint, his profeffional emoluments and reputation continued to increafe; and in 1796 he was appointed, without folicitation, and even without his knowledge, phyfician to the lunatic afylum, near York, called the "Retreat," eftablifhed by the fociety of quakers, for the relief of the infane members of their community. He was a member of the medical focieties of Edinburgh, of the medical fociety of London, and of the Briftol medical fociety; in the latter of which he was propofed by a gentleman to whom he was perfonally unknown, (Dr. Fox,) and who informed him of his election in an epiftle highly flattering to his literary and profeffional attainments. Dr. Fowler continued his ufeful career, active in every duty that benevolence could dictate, or friendfhip demand, and, in the exercife of his profeffion, an example of generofity, unwearied diligence and humanity, until the year 1801, when he died, on July 22d, while upon a vifit to fome friends in London.

He was attached to the ftudy of medicine with almoft enthufiaftic partiality, and ftudioufly cultivated as a fcience, what he induftrioufly practifed as a duty. He exemplified the method recommended by lord Bacon for the improvement of medicine, perhaps more than any of his predeceffors or contemporaries; and fome idea of his indefatigable labours may be conceived, when we mention, that he left in manufcript the hiftory of more than fix thoufand cafes, which fell under his own infpection and treatment. From this ftore of experimental knowledge he publifhed feveral works. The firft of thefe was entitled, "Medical Reports on the Effects of Tobacco," which was publifhed in the year 1785; and in the year following his fecond treatife appeared, under the title of "Medical Reports on the Effects of Arfenic." Thefe ufeful works tended, in a confiderable degree, to remove the fears and prejudices of practitioners with regard to thefe violent, but, under proper regulation, important and moft beneficial agents, and to inftruct the profeffion in the means of rendering them fafe and manageable as remedies; and accordingly they are now, more efpecially the latter, in daily and familiar ufe, and rank among the valuable articles of the materia medica. Even during the two years, in which his literary exertions were confiderably impeded by the painful difeafe under which he laboured, he was actively employed, in the intervals of eafe, in arranging from his notes materials for other works upon the fame plan; and in 1795 he dedicated to the medical profeffors of Edinburgh a volume of "Medical Reports on the acute and chronic Rheumatifm." Had his ufeful life been prolonged, he would have purfued ftill farther this plan of inductive experience, after the Baconian fyftem, and have contributed to the farther advancement of his favourite fcience. He was, befides, the author of feveral papers, printed in different volumes of the Medical Commentaries, and Annals of Medicine, edited by Drs. Duncan of Edinburgh. See Ann. of Med. for 1801.

FOWLING, the act or art of catching birds with nets, birdlime, decoys, and other devices; as alfo of breeding up the fame.

Fowling is alfo ufed for the purfuing and taking of birds with hawks, falcons, and other birds of prey; more properly called falconry and hawking.

Fowling-*piece*, a portable fire-arm for the fhooting of birds. Of fowling pieces, thofe are reputed the beft, which have the longeft barrel, *viz.* from $5\frac{1}{2}$ feet to 6, with a moderate bore; though for different occafions they fhould be of different forts and fizes: but in all it is effential the barrel be well polifhed, and fmooth within, and the bore of an uniform bignefs, from one end to another; which may be proved by thrufting in a piece of wood, cut exactly to the bore of the muzzle, down to the touch-hole; for if this goes down without ftoppage, you may conclude that the bore is good. The bridge-pan fhould be a little above the touch-hole, and ought to have a notch to let down a little powder, which will prevent the piece from recoiling. The locks fhould be accurately filed, and their fprings be neither too ftrong nor too weak. The hammer ought to be well hardened, and pliable, fo as to go down to the pan with a quick motion.

The following obfervations on the manufacture and perfection of a fowling-piece are extracted from the "Pantologia." In forming the gun-barrel, the workmen begin by heating and hammering out a bar of iron into the form of a flat ruler, thinner at the end intended for the muzzle, and thicker at that for the breech; the length, breadth, and thicknefs of the whole plate being regulated by the intended length, diameter, and weight of the barrel. This oblong plate is then, by repeated heating and hammering, turned round a cylindrical rod of tempered iron, called a mandril, whofe diameter is confiderably lefs than the intended bore of the barrel. The edges of the plate are made to overlap each other

other about half an inch, and are welded together by heating the tube in lengths of two or three inches at a time, and hammering it, with very brifk but moderate ftrokes, upon an anvil which has a number of femi-circular furrows in it, adapted to the various fize of the barrels. The heat required for welding is the bright white heat, which immediately precedes fufion, and at which the particles of the metal unite and blend fo intimately with each other, that, when properly managed, not a trace is left of their former feparation. Every time the barrel is withdrawn from the forge, the workman ftrikes the end of it once or twice gently againft the anvil in an horizontal direction: this operation, called by the Englifh artifts "jumping," and by the French "eftoquer," ferves to confolidate the particles of the metal more perfectly, and to obliterate any appearance of a feam in the barrel. The mandril is then introduced into the bore or cavity; and the barrel, being placed in one of the furrows or moulds of the anvil, is hammered very brifkly by two perfons befides the forger, who all the while keeps turning the barrel round in the mould, fo that every point of the heated portion may come equally under the action of the hammers. Thefe heatings and hammerings are repeated until the whole of the barrel has undergone the fame operation, and all its parts are rendered as perfectly continuous as if it had been bored out of a folid piece.

The imperfections to which a gun-barrel is liable in forging are of three kinds, *viz.* the chink, the crack, and the flaw. The chink is a folution of continuity, running lengthways of the barrel; the crack is a folution of continuity, more irregular in its form than the chink, and running in a tranfverfe direction, or acrofs the barrel; the flaw is a fmall plate or fcale, which adheres to the barrel by a narrow bafe, from which it fpreads out as the head of a nail does from its fhank; and, when feparated, leaves a pit or hollow in the metal. The chink and flaw are of much greater importance with regard to the foundnefs of the barrel than the crack, as the effort of the powder is exerted upon the circumference, and not upon the length of the barrel. The flaw is much more frequent than the chink. Thefe defects, within the barrel, are of a material difadvantage, by affording a lodgement to moifture and foulnefs that corrode the iron, and thus continually enlarge the excavation until the barrel burfts, or becomes dangerous to ufe.

The barrel, when forged, is either finifhed in the common manner, or made to undergo the operation of twifting, which is a procefs employed in thofe barrels that are intended to be of a fuperior quality and price to others. This operation confifts in heating the barrel, in portions of a few inches at a time, to a high degree of red heat; when one end of it is fcrewed into a vice, and into the other is introduced a fquare piece of iron with a handle like an augre; and by means of thefe, the fibres of the heated portion are twifted in a fpiral direction, that is found to refift the efforts of the powder much better than a longitudinal one.

It is a circumftance of confiderable importance with refpect to the excellence of a barrel, that it fhould be forged as nearly as poffible to its weight when finifhed, fo that very little may be taken away in the boring and filing: for, as the outer furface, by having undergone the action of the hammer more immediately than any other part, is rendered the moft compact and pure, we fhould be careful to remove as little of it as poffible. Such is alfo the cafe, though in a lefs degree, with regard to that portion of the middle of the barrel which is to be cut out by the boring inftrument.

Piftol-barrels are forged in one piece, and are cut afunder at the muzzles after they have been bored; by which there is not only a faving of iron and of labour, but a certainty of the calibre being perfectly the fame in both.

The next operation confifts in giving to the barrel its proper calibre; this is termed boring. The boring bit is a rod of iron, fomewhat longer than the barrel; one end being made to fit the focket of the crank, and the other being furnifhed with a cylindrical plug of tempered fteel, about $1\frac{1}{2}$ inch in length, and having its furface cut in the manner of a perpetual fcrew, the threads being flat, about $\frac{1}{8}$ of an inch in breadth, and running with very little obliquity. This form gives the bit a very ftrong hold of the metal; and the threads, being fharp at the edges, fcoop out and remove every roughnefs and inequality from the infide of the barrel, and render the cavity fmooth and equal throughout. A number of bits, each a little larger than the preceding one, are afterwards fucceffively paffed through the barrel in the fame way, until it has acquired the intended calibre. The equality of the bore is of great moment; and it may be tried with tolerable accuracy, by means of a plug of lead, caft on a rod of iron or wood; or even by a mufket-ball, filed fo as to fit the bore exactly, and pufhed through the barrel by the ram-rod; care being taken not to ufe an iron ram-rod, or much force, left the ball be flattened, and an artificial difficulty created.

The gun-fmiths afterwards polifh the barrel; and it is then in a condition to receive its proper form and proportions externally, by means of the file. To do this with accuracy, four flat fides or faces are firft formed; then eight, then fixteen, and fo on, until it is made quite round; except the reinforced part, which, in moft of the modern work, is left with eight fides.

It is abfolutely neceffary to the foundnefs of a barrel, that it fhould be of an equal thicknefs on every fide; or, in the language of the workmen, a barrel ought to be perfectly upright. To accomplifh this, the gun-fmiths employ an inftrument which they call a "compafs," confifting of an iron rod bent fo as to form two parallel branches, about an inch diftant from each other. One of thefe branches is introduced into the barrel, and kept clofely applied to the fide by means of one or more fprings with which it is furnifhed; the other branch defcends parallel to this, on the outfide, and has feveral fcrews paffing through it with their points directed to the barrel. By fcrewing thefe until their points touch the furface of the barrel, and then turning the inftrument round within the bore, it is feen where the metal is too thick, and how much it muft be reduced in order to render every part of the barrel perfectly equal throughout its circumference. To form the fcrew in the breech-end of the barrel, the firft tool employed is a plug of tempered fteel, fomewhat conical, and having upon its furface the threads of a male fcrew. This tool, which is termed a "fcrew-tap," being introduced into the barrel, is turned from left to right, and back again, until it has marked out the three or four firft threads of the fcrew; another lefs conical tap is then introduced; and when this has carried on the impreffion of the fcrew as far as it is intended to go, a third tap is employed, which is nearly cylindrical, and fcarcely differs from the plug of the breech which is intended to fill the fcrew thus formed in the barrel. The breech-plug has its fcrew formed by means of a fcrew-plate made of tempered fteel, and has feveral female fcrews correfponding with the taps employed to form that in the barrel. A plug of feven or eight threads is fufficiently long; and the threads ought to be neat and fharp, fo as to fill completely the turns made in the barrel by the tap. The breech-plug is afterwards cafe-hardened, or, has its furfaee

 converted

converted into ſteel, by being covered over with ſhavings of horn, or parings of horſe-hoof, and kept red-hot in the fire for ſome time, after which it is plunged into water.

The laſt operation is that of colouring the barrel, previouſly to which it is poliſhed with fine emery and oil, until it preſents to the eye, through its whole length, and in whatever direction it is obſerved, a perfectly ſmooth, equal, ſplendid ſurface. Inſtead of blueing the barrels by expoſing them to a degree of heat, which produced an elegant blue tinge, which was formerly done, they are now browned, as it is termed. To do this, the barrel is rubbed over with aqua fortis, or ſpirits of ſalt, diluted with water, and laid by until a complete coat of ruſt is formed upon it; a little oil is then applied; and the ſurface, being rubbed dry, is poliſhed by means of a hard bruſh and bees' wax.

Barrels intended for a double-barrelled piece, after having been dreſſed to their proper thickneſs, which is generally leſs than for ſingle barrels, are filed flat on the ſides that are to join each other, ſo that they may fit cloſe together. Two correſponding notches are then made at the muzzle and breech of each barrel; and into theſe are fitted two ſmall pieces of iron, to hold them more ſtrongly together. The barrels being united by tinning the parts which touch, the ribs are fitted in, and made faſt by the ſame means. Theſe ribs are the triangular pieces of iron which are placed between the barrels, running on the upper and under ſides their whole length, and ſerving to hold them more firmly together. The under rib is a late improvement, and is found more effectually to prevent the barrels from warping. When the barrels are thus joined, they are poliſhed and coloured in the manner already deſcribed.

The twiſted barrels are deſervedly commended for their ſuperior elegance and ſtrength, as well as for the accuracy with which they throw their ball or ſhot. The iron employed in them is formed of old horſe-ſhoe nails, originally made from the ſofteſt and tougheſt iron, which is farther purified by the numerous heatings and hammerings by which it is reduced firſt into a bar, and then into nails. About 28 pounds of theſe ſtubs, purchaſed at about 10*s.* *per cwt.*, are required to make a ſingle barrel of the ordinary ſize. A hoop of iron, about an inch broad, and ſix or ſeven inches in diameter, is placed perpendicularly; and the ſtubs, previouſly waſhed, are neatly piled in it, with their heads outermoſt on each ſide, until the hoop is quite filled and wedged tight with them; the whole reſembling a rough circular cake of iron. This is put into the fire until it has acquired a white heat; when it is hammered, either by the ſtrength of the arm, or by the force of machinery, until it becomes one maſs of ſolid iron; the hoop is then removed, and the heatings and hammerings repeated, until the iron, by being thus wrought and kneaded, is freed from all impurity, and rendered very tough and cloſe in the grain: the workman then draws it out into pieces of about 24 inches in length, half an inch or more in breadth, and half an inch in thickneſs. Theſe pieces, however, are of different thickneſs, according to the propoſed thickneſs of the barrel, and that part of it which the piece was intended to form. One of theſe pieces, being heated red-hot for five or ſix inches, is turned like a cork-ſcrew, without any other tools beſides the anvil and hammer. The remaining portions are treated in the ſame manner, until the whole piece is turned into a ſpiral, forming a tube whoſe diameter correſponds with that of the intended barrel. Four of theſe are generally ſufficient to form a barrel of the ordinary length, which is from 32 to 38 inches, and the two which form the breech or reinforced part are conſiderably thicker than thoſe which conſtitute the fore-part, or muzzle of the barrel. The workman firſt welds one of theſe tubes to a part of an old barrel, which ſerves as a handle. He then proceeds to unite the turns of the ſpiral to each other, by heating the tube two or three inches at a time, to a bright white heat, and ſtriking the end of it ſeveral times againſt the anvil in a horizontal direction, and with conſiderable force; this is termed jumping by the barrel; and the heats given for this purpoſe are called jumping-heats. A mandril is then introduced into the cavity; and the heated portion is hammered ſlightly, to flatten the ridges or bars raiſed by the jumping at the place where the ſpirals are joined. As ſoon as one piece is jumped its whole length, another is welded to it, and treated in the ſame manner, until the four pieces are united; when the part of the old barrel, being no longer neceſſary, is cut off. The welding of the turns of the ſpiral is performed in the manner already deſcribed, and is repeated three times. The barrel is afterwards finiſhed in the ſame mode as the common one.

Stub iron is alſo wrought into plain barrels; which, as they require much leſs labour, are only half the price of the twiſted ones.

The "canons or rubans," or ribbon barrels of the French, very much reſemble the Engliſh twiſted barrels. The proceſs by which they are formed is much more operoſe than that above deſcribed, without poſſeſſing any ſuperior advantage.

It is obſerved, as the reſult of various experiments with barrels of 28, 30, 32, 34, 36, 38, and 40 inches in length, that the difference of 10 inches in the lengh of the barrel, which ſeems to be more than ſportſmen require, produces no ſenſible difference in the range of the piece; and, therefore, that every one may pleaſe himſelf in the length of his barrel, without detriment or advantage to the range. (See Range.) The circumſtance, it is ſaid, of a duck-gun killing at a greater diſtance than a fowling-piece, is not owing to its length, but to its greater weight and thickneſs, allowing the charge of powder to be doubled, trebled, or even quadrupled; which cannot be done in a fowling-piece, though ſtrongly reinforced. Duck-guns are generally bent a little upwards near the muzzle, which, as the gunſmiths ſay, makes them throw their ſhot further than if they were perfectly ſtraight. To obtain from a piece of the ordinary length the ſame effects as from a duck-gun, nothing more, perhaps, is neceſſary, than to have the barrel ſufficiently ſtrong to admit of the charge being doubled or trebled as required, and the whole piece heavy enough to render the recoil ſupportable. It is further obſerved, that an increaſe of the powder above the charge generally uſed, does not produce a proportional increaſe of range in the ball or ſhot: thus, a double charge of powder will not throw the ball or ſhot to twice the diſtance, nor a treble charge to three times the diſtance, of the ſingle charge. This is owing to the great reſiſtance given by the air to the motion of the ball or ſhot, which is proved to be four-fold if the velocity be doubled, and nine-fold when it is trebled by an increaſe of powder; for the reſiſtance of the air is not proportional to the velocity itſelf, but only to the ſquare of the velocity. (See Gunnery and Resistance.) So great is the change in opinion of late, with regard to the proper length of gun-barrels, that many gunſmiths will now tell us, that ſhort barrels carry farther than long ones; and the reaſon they give for it is, the greater friction of the ball or ſhot in paſſing through a long barrel, by which their velocity is retarded and their force diminiſhed. If the barrel is ſo long that the additional impulſe which the ball or ſhot is continually receiving in its paſſage

becomes lefs than the friction between them and the fides of the calibre, then, indeed, the barrel, by being fhortened, will fhoot with greater force; but as the length of the barrel required to produce this effect is vaftly greater than can ever be employed for any purpofe, the objection does not hold. It feems clear, that a piece may be made fo long, that it will not throw a ball with fo great velocity as one that is confiderably fhorter; and the reafon of this decreafe of velocity may be, that in very long pieces the increafe of the counter-preffure of the external air in the cylinder, may greatly exceed the force of the powder, and that the elaftic fluid generated by the explofion of the powder is conftantly efcaping whilft the ball paffes along the cylinder, which it not only does at the touch-hole, but alfo between the ball and the fides of the barrel; and hence may be inferred the neceffity of touch-holes which do not prime of themfelves, and of wadding that ftops the barrel hermetically. The following opinion is given by the ingenious writer of the article to which we have referred with regard to the length of barrel that is beft calculated for general ufe. The barrels which are found to anfwer beft for every purpofe are from thirty-two to thirty-eight inches; and whether we confult the appearance of the piece, its lightnefs, or the eafe with which it is managed, we believe, (he fays,) that a barrel not exceeding the one, or below the other, of thefe numbers, is the moft eligible. We know that many of the gunfmiths pique themfelves on the proportion they give to the different parts of their fowling-pieces, and thence deduce a fuperiority over their contemporaries in favour of their own. To us it appears that the beauty of thofe proportions is more attended to than any good reafon why they are made fo rather than otherwife. For other particulars fee Proving *of Guns*, Range, Recoil, and Rifle.

In fhooting, obferve to do it with the wind, if poffible, and rather fide-ways, or behind the fowl, than full in their faces. Obferve alfo to chufe the moft convenient fhelter, as a hedge, bank, or tree. If you have not fhelter enough, you muft creep upon your hands and knees, or ufe a ftalking-horfe. Let your dogs be under good command. See Dog, Setting-*Dog*, and Spaniel.

FOX, Richard, in *Biography*, a celebrated Englifh ftatefman and prelate, was defcended from parents in mean circumftances, and born at Ropefley, near Grantham, in Lincolnfhire, about the end of the reign of Henry VI. Having paffed through the introductory fteps of learning, he was fent to Magdalen college, Oxford, where he acquired diftinguifhed reputation by the progrefs he made in his ftudies. The plague, then not unfrequent in England, broke out in Oxford, which forced Mr. Fox to finifh his education at Pembroke Hall, Cambridge, and from thence he went to Paris to ftudy canon law and theology. In this city he obtained the notice and friendfhip of Dr. Morton, bifhop of Ely, who had been driven from his native foil by the perfecutions of the infamous Richard III. It was by the means of this prelate that Fox, who had been created doctor, was introduced to Henry, earl of Richmond, who was at that time projecting a fcheme to dethrone Richard. Dr. Fox entered into his views, was admitted into his moft fecret counfels, and undertook and accomplifhed that part of the plan which was entrufted to him. After Henry had gained the crown of England as the refult of the victory of Bofworth-field, he appointed Dr. Fox one of his privy councillors, and, next to Dr. Morton, admitted him to the greateft fhare of his confidence and familiarity. Befides other inftances of preferment, he was nominated in 1486-7 bifhop of Exeter; appointed keeper of the privy feal; made principal fecretary of ftate, and mafter of St. Croffe, near Winchefter. From this time, notwithftanding his high ftation in the church, Dr. Fox was conftantly engaged by his fovereign, either in the management of public affairs at home, or on important foreign embaffies. In 1491 he was tranflated from Exeter to the bifhopric of Bath and Wells; whence he was afterwards removed to Durham in 1494. He was now fent on an embaffy to James IV. of Scotland to terminate fome differences refpecting the fifheries of the river Efk; but with all his ability and addrefs he was unable to effect the purpofe. War was commenced by James, who invaded England, but by the exertions of the bifhop he was driven back to his own country. Shortly after Henry appointed bifhop Fox his ambaffador to the court of Scotland, where he figned a feven-years truce between the two kingdoms. Henry now made overtures for a marriage between the king of Scotland and his own daughter Margaret, and Dr. Fox was fent to negociate the important bufinefs, which was concluded in the beginning of the year 1501-2. During this negociation he was chofen chancellor of the univerfity of Cambridge; and about the fame time tranflated to the vacant fee of Winchefter. Here he fpent the remainder of his days in great affluence and profperity, unlefs when ftate affairs required his attendance at court, or he was engaged in conducting negociations of moment with foreign powers. During the reign of Henry VII. no important affair was undertaken without his advice and fanction, but when Henry VIII. fucceeded to the crown, the influence of bifhop Fox began to decline, and that of Thomas Howard, earl of Surrey, to prevail. To fupplant his rival the bifhop introduced Wolfey, one of his chaplains, to court, who fpeedily fucceeded in wholly engroffing the favour of the king. No fooner did he find himfelf fecure of the royal attachment, than he feized the fole adminiftration of public affairs, and found means of driving from court all who could give him any jealoufy or uneafinefs, by dividing with him the monarch's efteem. Bifhop Fox, though not wholly neglected, was mortified and chagrined at feeing his own interefts completely undermined by Wolfey, whom he had been the means of raifing to power, and receiving from him infults and mortifications which his fpirit could not brook, retired to his diocefe in difcontent and difguft. Here he did not live for himfelf alone, but was ever projecting fome plans that might be beneficial to pofterity. He founded Corpus Chrifti college, Oxford, and eftablifhed fchools at Taunton, where he had a manor, as bifhop of Winchefter, and at Grantham, near his native place. Towards the clofe of life he had the misfortune to lofe his fight, of which circumftance Wolfey, then a cardinal, wifhed to take advantage, by perfuading him to refign his bifhopric, and to receive, in its ftead, a penfion from the crown. Fox, indignant at the propofal, ordered the perfon fent to him on the bufinefs to tell his mafter, "that though he was blind, and was not able to diftinguifh white from black, yet he could difcern between true and falfe, right and wrong: and plainly faw, without eyes, the malice of that ungrateful man, which he did not fee before. That it behoved the cardinal not be fo blinded with ambition as not to forefee his own end." The bifhop died in the year 1528, at a very advanced age, leaving behind him a character very eminent for political fagacity, and the ability and addrefs with which he conducted the moft important and difficult ftate negociations of his time. He has been regarded as a patron of learned men, and is certainly entitled to gratitude on account of the ufeful inftitutions which he founded for the encouragement of literature and fcience. One letter is preferved in Strype's Memorials, which he wrote on the fubject of the cardinal's intended ge-

neral viſitation and reformation of the Engliſh clergy. That day, he ſays, he wiſhed as ardently to ſee, as Simeon did to behold the Meſſiah; and he adds, that for three years paſt, almoſt all his ſtudies, labours, thoughts, and cares, had been directed to that object within his own particular juriſdiction. Biog. Brit.

Fox, Edward, likewiſe a prelate and ſtateſman, was born at Durſley, in Glouceſterſhire; educated at Eton, and purſued his more advanced ſtudies at King's college, Cambridge, to which he was admitted in the year 1512. He was ſoon found to poſſeſs great talents, and to be eminently qualified for ſtations of activity and confidence. In the year 1528 he was elected provoſt of his college, and retained that poſt to the time of his death: in the ſame year Wolſey appointed him, jointly with Gardiner, afterwards the biſhop of Wincheſter, embaſſador to Rome to obtain the conſent of pope Clement VII. for the divorce of Henry VIII. from his queen Catherine of Arragon. After his return he was appointed to embaſſies both in France and Germany; and having accompliſhed theſe to the ſatisfaction of his maſter, he was ſent to Cambridge with Gardiner, and, notwithſtanding the oppoſition they met with, they obtained the univerſity's determination, that "the king's marriage was againſt the law of God." From this time he was in high favour, and received as a remuneration for his ſervices valuable preferments in the church, and in 1535 he was promoted to the biſhopric of Hereford. In the ſame year he was ſent to the proteſtant princes then aſſembled at Smalkalde, whom he exhorted to unite in point of doctrine with the church of England. After three months' negociation nothing was effected, and the biſhop returned to England in 1536, and having enjoyed his biſhopric ſomewhat leſs than three years, he died at London in the year 1538. As an author he left behind him a treatiſe "De vera differentia regiæ Poteſtatis et eccleſiaſticæ, et quæ ſit ipſa veritas utriuſque," 1534, which was afterwards tranſlated into Engliſh by Henry lord Stafford. He wrote "Annotations upon the Mantuan poet." There is alſo extant an "Oration" of his, and a joint letter from him and Gardiner, concerning their proceedings at Cambridge. This is among the collection of records at the end of the firſt volume of Burnet's hiſtory of the Reformation. He was a man of great talents and learning, an excellent preacher, but choſe rather to devote himſelf to the buſineſs of a ſtateſman than to the duties of the clerical character. He was a ſecret well wiſher to the reformation, and contributed privately, by his influence and advice, to the furtherance of the meaſures by which it was ultimately effected. Biog. Brit.

Fox, John, was born at Boſton, Lincolnſhire, of reſpectable parents, in the year 1517. At ſixteen years of age he was entered at Brazen-noſe college, Oxford; in the year 1538, he took his firſt degree, and, on account of his extraordinary proficiency, he was, in 1543, elected a fellow of Magdalen college, and proceeded M.A. Early in life he diſcovered a turn for poetry, and wrote ſeveral Latin comedies; of which one, entitled, "De Chriſto triumphante," was publiſhed at London and at Baſil, and tranſlated by Richard Day, ſon of the famous printer, in the reign of queen Elizabeth. Fox had a ſtill ſtronger predilection for divinity than for poetry, and ſtudied with the utmoſt fervour and aſſiduity, till he had made himſelf maſter of all the controverſies that then agitated the Chriſtian world, and to diſcover from his own inquiries what was truth. For this purpoſe he had, when he was thirty years of age, read over all the Greek and Latin fathers, the ſchoolmen, the decrees of councils and conſiſtories; and had acquired an accurate knowledge of the Hebrew language. In the courſe of his inquiries, he became ſatisfied of the errors of popery; and being reſolved to follow truth wherever ſhe might lead him, he abſtained from the eſtabliſhed worſhip of the country. His enemies, ſuſpecting the fact, charged him with hereſy, for which he was tried, and found guilty. He was expelled the houſe, and told that he might conſider it a mark of great clemency and particular favour towards him, that the puniſhment did not extend to take away his life. By this event, Mr. Fox loſt the favour of his friends, who were alarmed at being ſuppoſed to countenance and protect a perſon convicted of ſo great a crime. His father-in-law, alſo, who was entruſted with the care of his property, took advantage of his ſituation to withhold from him his paternal eſtate; thinking, no doubt, that as he was become obnoxious to the penalties of the law himſelf, he would find it difficult to maintain his rights, ſhould he appeal to the courts for that purpoſe. Mr. Fox was now on the verge of great diſtreſs, when he unexpectedly met with a friend in ſir Thomas Lucy of Warwickſhire, who appointed him tutor to his children. In the houſe of this gentleman he continued till his pupils were grown up, during which time he had married the daughter of a citizen of Coventry. A few years before the death of Henry VIII. he went to London; but not being able to meet with employment, he was again reduced to extreme diſtreſs, and in danger of periſhing through want. From an unknown perſon, who had ſeen him ſitting one day in St. Paul's cathedral, bent down under his diſtreſſes, he received relief; and in a very ſhort time afterwards he was ſo fortunate as to be taken into the ducheſs of Richmond's family, to educate the children of her brother, the famous Henry Howard, earl of Surrey, who were entruſted to her care, when their father was ſent to the Tower by Henry VIII. In this noble family he continued to reſide during the remainder of Henry's reign, through the whole of that of Edward, and part of that of Mary; being protected in the latter period by the duke of Norfolk, who had been one of his pupils. He is ſaid, by Anthony Wood, to have been reſtored to his fellowſhip in Magdalen college, under the reign of Edward VI., and to have been the firſt perſon who preached the reformed doctrines at Ryegate. The bloody-minded Gardiner was thirſting after the life of this excellent man; and it was with the utmoſt difficulty that he eſcaped the ſnares laid for him by that cruel prelate, who had iſſued warrants for apprehending him and his wife. At length they reached the continent in ſafety, and took up their reſidence at Baſil. Here he gained a ſubſiſtence, by correcting the preſs for Oporinus, a celebrated printer; and here he formed the deſign of his "Acts and Monuments of the Church." He had, ſome time before this, publiſhed at Straſburgh, "Commentarii Rerum in Eccleſia geſtarum, maximarumque per totam Europam Perſecutionum a Wiclevi Temporibus ad hanc uſque Ætatem Deſcriptarum," in one book; to which he now added five others, and they were all printed at Baſil, in 1559, in folio. In Germany, Mr. Fox joined the other Engliſh exiles in publicly uſing the liturgy adopted by the French and Genevan reformed churches, in preference to that ordered by king Edward. On the acceſſion of queen Elizabeth, Mr. Fox returned to his native country, where he was kindly received by his former pupil, the duke of Norfolk, who maintained him at his houſe as long as he lived, and ſettled a penſion upon him at his death. By the intereſt of Cecil, he had formerly obtained a prebend in the church of Saliſbury: ſo high did he now ſtand with people in power and rank, that he might have had any preferment; but he choſe to decline farther

elevation,

elevation, becaufe he could not confcientioufly fubfcribe to the articles enforced by the ecclefiaftical commiffions, and becaufe he alfo difapproved of fome of the ceremonies of the church. To give countenance to conformity, Mr. Fox was called on by archbifhop Parker to fubfcribe. He attended, according to the fummons; but, in reply to the command, he took from his pocket a Greek Teftament, and faid, "To this will I fubfcribe." And on another occafion, when he was required to fubfcribe to the canons, he refufed, faying, "I have nothing in the church fave a prebend at Salifbury, and much good may it do you, if you will take it from me." He was, however, too highly refpected by the bifhops, moft of whom had been his fellow-exiles, to be further molefted; and he was allowed to retain his prebend till his death. In 1564, he addreffed a Latin panegyric to the queen, upon her indulgence to certain divines, who fcrupled ftrict conformity, and yet were fuffered to hold their livings, and retain their dignity in the church. This moderation was not always the characteriftic of the queen. In 1575, a furious perfecution was commenced againft the baptifts. A number of them were apprehended in a private houfe, where they were affembled for worfhip, and afterwards tried for herefy. Eleven were condemned to die; and of thefe nine were banifhed, and two fentenced to the flames. Mr. Fox underftood too well the nature of Chriftian liberty, and the principles of toleration, not to feel moft acutely for the victims about to be facrificed at the fhrine of prejudice and intolerance. He wrote a Latin letter to the queen, in which he expofed the cruelty and iniquity of punifhing with death perfons guilty of error, or obftinacy of judgment; and fhewed how inconfiftent fuch conduct was with the benevolent fpirit and pure precepts of the gofpel. His interceffion was without effect; for though Elizabeth had fo high a refpect for Fox as conftantly to denominate him "Father," yet in this inftance fhe refolved to fhew no mercy, as it was falfely called, unlefs the unfortunate men fhould recant. Mr. Fox, as we have feen, would accept of no higher preferment; neverthelefs he was frequently engaged as a preacher, and never omitted an opportunity of exerting his talents, where he thought he could promote the real interefts of religion. His piety and zeal were ardent and animated; his moral conduct ever correfponded with his principles, and was irreproachable. He was modeft, humble, obliging, and remarkable for his humanity and kindnefs to the poor. He died in his 70th year, on the 18th of April, 1587, generally efteemed and lamented by all who knew him. He was author of many pieces, befides thofe which have been already noticed: their titles, with their feveral dates, are given in the Biographia Britannica. We may here refer to his "Tables of Grammar," which were at firft recommended by eight lords of the privy council, but which were foon laid afide on account of their brevity; being, it is faid, as much too fhort for general ufe, as king Henry VIII.'s grammar was too long. "The four Evangelifts, in the old Saxon tongue, with the Englifh verfion added to it." But the grand work of this good man is his "Hiftory of the Acts and Monuments of the Church," generally known by the title of "Fox's Book of Martyrs." This, as we have feen, was begun at Bafil; but the greater part of it was written after the author's return from exile to his native land, where he had accefs to ample authorities, and could avail himfelf of the teftimonies of living witneffes. He was eleven years in completing the great undertaking, and, according to Whitgift, he "very diligently and faithfully laboured in this matter, and fearched out the truth of it as learnedly as any man has done." Camden gives the following teftimony to Mr. Fox, and his "Acts and Monuments:" "Ex eruditorum numero obiit Johannes Foxus Oxonienfis, qui ecclefiafticam Angliæ hiftoriam, five martyrologiam, indefeffo veritatis ftudio, primum Latinè, poftea Anglicè auctius, magna cum laude contexuit." The "Acts and Monuments" were firft publifhed in one thick volume, folio, in the year 1563; but in 1583, a fourth edition of it was printed at London, in two volumes, folio; and in the middle of the following century it came out in three volumes. The ninth edition of this work appeared in 1684, in three volumes, folio, with copper-plate cuts, inftead of the wooden ones which h[illegible] been interwoven with the former impreffions. In queen Elizabeth's time, an order was made that this book fhould be placed in the common halls of the archbifhops, and of all bifhops, deans, archdeacons, heads of colleges, &c. It was, indeed, fo highly valued by proteftants in general, that it was not unufual to have it kept in churches. We have feen a copy in a country church, faftened by chains in fome confpicuous place, for the benefit of thofe who reforted to the place for the purpofes of devotion and information. The papifts, as was natural, did all in their power to ruin the credit of the work, and injure the reputation of the author; and fome proteftants have taken every opportunity to undervalue and depreciate it, afferting that the facts are defignedly mifreprefented. Such a charge led to a ftrict examination of the merits of the performance; and it was acknowledged by Burnet and Strype to be a faithful record of the events that took place, not indeed without defects, not wholly without error, but free from every imputation of defigned mifreprefentation: and, to the honour of the author, he was ever ready to correct fuch miftakes as were pointed out to him. This fubject is difcuffed with candour and ability in the Biographica Britannica, to which the reader is referred.

Fox, George, founder of the fociety of friends, commonly called quakers, was born at Drayton, in Leicefterfhire, in 1624. His father was a weaver, much refpected by his neighbours for his piety and virtues; and he feems to have taken great pains in educating his fon in the principles of piety and virtue. He was, at a proper age, apprenticed to a dealer in wool and grazier, and was a good deal employed in keeping fheep: an occupation that afforded him opportunities for contemplation and reflection. When he was about nineteen years of age, he experienced much trouble and anxiety on obferving the intemperance of fome perfons, profeffing to be religious, with whom he had gone to an inn for refrefhment; and on the following night he was perfuaded that a divine communication was made to him, urging him to forfake all, to feparate himfelf from the old and the young, and devote his life to the duties of religion. Satisfied with the divine command, he renounced fociety, quitted his relations, dreffed himfelf in a leathern doublet, and wandered about from place to place. At length he reached the metropolis, when his friends interfered, and befought him to return and fettle in fome regular employment. He returned, but did not remain with them many months; determining to embrace an itinerant mode of life. He fafted much and often, walked abroad in retired places, with no other companion but the bible, and fometimes fat in the hollow of a tree for a day together, and walked in the fields by night, as if in a ftate of deep melancholy. He occafionally attended upon public teachers, but did not derive that benefit from them that he looked for: and hearing, as he fuppofed, a voice exclaiming, "There is one, even Chrift Jefus, that can fpeak to thy condition," he forfook the ufual outward means of religion; contending that as God did not dwell in temples made with hands, fo the

the people should receive the *inward* divine teaching of the Lord, and take that for their rule of life. About the year 1648, he felt himself called upon to propagate the opinions which he had embraced, and commenced public teacher in Manchester, and some of the neighbouring towns and villages, insisting on the certainty and efficacy of experiencing the coming of Christ in the heart, as a light to discover error, and the knowledge of one's duty. He now made more extensive journies, and travelled through the counties of Derby, Leicester, and Northampton, addressing the people in the market-places, and inveighing strongly against injustice, drunkenness, and the other prevalent vices of the age. About this time he apprehended that the Lord had forbidden him to take off his hat to any one; and required him to speak to the people in the language of *thou* and *thee;* that he must not bend his knee to earthly authorities, and that he must, on no account, take an oath. His peculiarities exposed him to much cruel treatment, and his zeal frequently was the cause of imprisonment and the most inhuman usage. At Nottingham, while the minister was exhorting the people to try all doctrines, opinions, and religions, by the holy scriptures, Fox stood up, and exclaimed, "Oh no! it is not the scriptures, but the holy spirit, by which opinions and religions are to be tried; for it was the spirit that led 30 people into all truth, and gave them the knowledge of it." Such an interruption was not likely to be endured; he was not only turned out of the church, but thrown into prison, where he was detained during the pleasure of the magistrates. At Mansfield, on a similar occasion, he was imprisoned, thrown into the stocks, and afterwards exposed to the madness of an infuriated mob, so that he scarcely escaped with his life. At Derby he was committed to prison for six months, under the pretence of having uttered divers blasphemous opinions; and at the expiration of the term, refusing to enlist as a common soldier, he was ordered into the dungeon, and confined for another term of six months. At Derby, the followers of Fox were first denominated "quakers," as a term of reproach, either on account of the trembling accent used in the delivery of their speeches, or, because, when brought before the higher powers, they exhorted the magistrates and other persons present "to tremble at the name of the Lord." At Lancaster, Carlisle, and other places, Fox met with similar usage, and in 1655 he was sent prisoner to Cromwell, who contented himself with obtaining a written promise that he would not take up arms against him or the existing government; and having discussed various topics with mildness and candour, he ordered him to be set at liberty. Fox probably now felt himself bold in the cause, recommenced his ministerial labours at London, and spent some time in vindicating his principles by means of the press, and in answering the books circulated against the society which he had founded, and which began to attract public notice in many parts of the kingdom. Notwithstanding the moderation of Cromwell towards Fox, he was perpetually subject to abuse and insult, and was frequently imprisoned and hardly used by magistrates in the country whither he felt himself bound to travel: and more than once he was obliged to solicit the interference of the Protector, to free him from the persecutions of subordinate officers. Once he wrote to Cromwell, soliciting his attention to the sufferings of his friends; and on hearing a rumour that he was about to assume the title of king, Fox solicited an audience, and remonstrated with him very freely upon the measure, as what must bring shame and ruin on himself and his posterity. He also addressed a paper to the heads and governors of the nation, on occasion of a fast appointed on account of the persecutions of the Protestants abroad; in which he embraced the opportunity that such appointment offered, of holding up, in proper colours, the impropriety and iniquity of persecution at home. The history of Fox, for several years previously to 1666, consists of details of his missions, and accounts of his repeated imprisonments. In this last-mentioned year he was liberated by order of the king, and he immediately set about forming the people who had embraced his doctrines into a compact and united body: monthly meetings were established, and other means adopted to provide for the various exigences to which they might be liable.

About the year 1669 he married Margaret, the widow of judge Fell, at whose house he had been entertained in his progress through Lancashire. The ceremony, on this occasion, was according to that simple form which is practised to this day among the people of his persuasion. He only acquainted their common friends of their intention; and having received their approbation, they took each other in marriage, by mutual public declarations to that intent, at a meeting appointed for the purpose at Bristol. After this Mr. Fox sailed for America, where he spent two years in making proselytes, and in confirming the faith and practice of those who had already joined in his cause. Soon after his return to England he was taken into custody, and thrown into Worcester gaol, under the ridiculous charge of having "held a meeting from all parts of the nation, for terrifying the king's subjects." During his imprisonment he was seized with an alarming illness, which rendered his recovery very doubtful. His wife went to London to solicit his release of the king, who was willing to grant it by means of a pardon. Fox, however, rejected the mode, as he conceived a pardon implied guilt: he chose rather to stand a trial, by which he was honourably acquitted, though not till he had suffered more than a year's very severe confinement. He next went to Holland, and on his return, a suit was instituted against him for refusing to pay tithes; his opponents were successful, and he was obliged to submit to the consequences. In 1684, Fox again visited the continent, and upon his return he found his health and spirits too much impaired by incessant fatigues, and almost perpetual persecutions, to contend any more with his enemies, he accordingly lived more retired; and in 1690 he died, in the sixty-seventh year of his age; having, however, performed the duties of a preacher, till within a few days of his decease. His writings, exclusive of a few separate pieces, which were not printed a second time, were collected in 3 vols. folio: the first contains his "Journal;" the second a collection of his "Epistles;" the third, his "Doctrinal Pieces." Fox was a man of good natural talents, and thoroughly conversant in the scriptures. The incessant zeal which he exhibited through life, affords abundant evidence of his piety, sincerity, and purity of intention; and his sufferings bear testimony to his fortitude, patience, and resignation to the Divine will. William Penn, speaking of him, says, that "he had an extraordinary gift in opening the scriptures, but that, above all, he excelled in prayer. The reverence and solemnity of his address and behaviour, and the ferventness and fullness of his words, often struck strangers with admiration." He also mentions, in terms of high commendation, his meekness, humility, and moderation; and he adds that he was civil beyond all forms of breeding; in his behaviour very temperate, eating little, and sleeping less, though a bulky person. Toulmin's edit. of Neal's hist. of Puritans. Gen. Biog.

Fox, Charles James, one of the moft eminent ftatefmen that ever lived, was third fon of Henry Fox, afterwards lord Holland, by lady Georgiana Carolina Lennox, eldeft daughter to Charles, fecond duke of Richmond, and was born January 13, 1749. Being intended for public life, he was fent firft to Weftminfter-fchool, and afterwards to Eton, when that feminary had attained a high degree of celebrity, under the direction of Dr. Bernard, the provoft. Here Mr. Fox was not only diftinguifhed with regard to claffical attainments; but he was obferved to be equally ardent in the purfuit of amufements and pleafures. Dr. Newcombe, the late learned primate of Ireland, was his private tutor, and, to the laft hour of his life, is faid to have thought more highly of the honour of having been inftrumental in educating fo great a ftatefman as Mr. Fox, than of any other circumftance in his life. His pupil obtained a decided fuperiority in every clafs which he joined. As his father hoped to introduce him early into public life, and was anxious to form him for a man of bufinefs, he had always encouraged him to think and to fpeak freely; hence he acquired the habit of a ready elocution. In every enterprize at fchool, which required an orator, he was generally felected, and nothing can better fhew the ftrength of his mind, and of his conftitution, than, that by turns, literature and diffipation appeared to engrofs his whole attention, and yet that the apparent preference of the one was not allowed to interfere with the other. He was never fatisfied with mediocrity in any purfuit; whatever he regarded as deferving his attention, he followed with ardour. At Eton he formed his early friendfhips with many of the moft eminent characters of the age, fome of whom forefaw in their contemporary all the feeds of future greatnefs, and of that renown for which he will be celebrated in every fucceeding period of Britifh and European hiftory. It was not merely the rifing fuperiority of talents by which he was diftinguifhed from his fchool-fellows: the kindnefs of his heart, and the mildnefs of his manners were equally confpicuous. He demonftrated, by the moft decifive traits of character, his attachment to the finer fenfibilities of humanity, by always efponfing, if it could be done with propriety, the weakeft fide, in thofe contefts which occafionally difturb the fociety of young people. He was frequently called upon to prefide as judge in difputes, and when he faw any one borne down by partiality and prejudice, he exerted his youthful eloquence in favour of the fide of juftice. From Eton he went to Oxford, where he entered himfelf at Hertford college, and is faid to have ftudied more than ten hours a day during the whole term. The uniformity of a college life did not long agree with the ardour of his mind, and after fome time he fet out on the ufual tour of Europe. No young man was ever better qualified to derive inftruction from thofe fcenes which are ever prefented to the mind of the traveller; and though he did not refrain from indulging in the diffipations, over which his rank and fortune gave him the command, yet he did not fail to acquire that intimate knowledge of the world and of human nature, which fitted him for the moft exalted rank in the ftate, and prepared his mind for the reception of thofe enlarged principles by which, with the exception of the firft year or two of his political life, he was diftinguifhed, as the zealous and fteady friend to the liberties and happinefs of the people; by which he was, as it were, habitually the advocate of the oppreffed, whofe caufe he pleaded with a force and eloquence unknown in modern times. An unfortunate attachment to the gaming table, which can never be paffed over in filence, nor fpoken of without becoming cenfure, was the principal error of Mr. Fox's youth. Before he was eighteen years of age he had lavifhed away large fums of money, and had contracted very heavy debts. His father, being apprized of thefe exceffes, urged his favourite fon to return home; he complied, though with fome degree of reluctance. From the fafcinating theatre of diffipation and pleafure, he was tranfplanted into that of oratory and politics; if the former had been more attractive, and apparently more accordant to his mind and habits, the latter was more important and honourable, and that on which he was deftined to act a part that can never be forgotten, and never fufficiently applauded. Lord Holland, well knowing the lively and impetuous difpofition of his fon, forefaw that a feat in parliament would be likely to detach him from a courfe which threatened irreparable injury to his conftitution, and ruin to his fortune; he, accordingly, in the election of 1768, when his fon was but nineteen years old, procured him the return for the borough of Midhurft, which was then under the patronage of his lordfhip, but which at prefent is under that of lord Carrington. By the laws of England, a perfon under age is not deemed competent to judge for himfelf, much lefs to make laws to govern others, and on this account our youthful fenator was ineligible to a feat in the houfe of commons. The circumftance feems to have been wholly overlooked by the fpeaker, and by that "committee of privileges," which is appointed by every parliament as the confervator of the rights of the commons of Great Britain. Such an overfight can fcarcely be accounted for; his attachments were fuppofed, from the conduct of his father, to be favourable to the exifting miniftry, whofe power and influence were, every day, attacked by an oppofition as formidable for rank and talents as ever exifted in the country. It is probable, yet we own there are no particular facts to bear us out, if the fuppofition be denied, that the conciliating manners, which, it is acknowledged on all hands, attracted the admiration, and even challenged the good will and affection of every perfon who knew him, prevented any meafures from being taken to difpoffefs him of his feat in parliament.

In the debates and proceedings of parliament, which we have carefully collated, from that period to the deceafe of Mr. Fox, we do not find that he took any part in the difcuffions till the 10th of January 1770, when he was within three days of attaining the full age, required by cuftom and by law, to entitle him to give his opinion in the houfe. Whether he had voted before this period, we have no means of afcertaining, becaufe it fhould feem that even now he defended the meafures of the adminiftration, whofe names, in the divifions of the houfe, are rarely mentioned, though it has ever been the cuftom to record the names of thofe who dare, in bad times, to ftand in a minority, and to fhare in the obloquy which weak and vulgar minds are apt to attach to the conduct of men who are feeking their country's welfare at the expence of their own eafe and advancement in life. On the ninth of January 1770, there had been a warm debate of more than twelve hours in the houfe on his majefty's fpeech, which referred, among other topics, to the difcontents exifting about the meafures of the Middlefex election: an amendment was moved "That the houfe would take into confideration the caufes of the unhappy difcontents that prevailed in every part of his majefty's dominions." On this, which was fuppofed as intended to annul the former refolutions of the houfe, debates ran very high; the oppofition held language which was deemed encroaching on the privilege of the houfe, and the refpect due to it.

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The oppofition divided 138 to 254, and their names are given in the "Proceedings of Parliament," vol. v. p. 205—6. On the following day, when the addrefs was reported, previoufly to its being delivered to his majefty, a fimilar difcuffion took place, when the leaders of oppofition took a moft diftinguifhed part. Sir George Saville diftinctly afferted, that "the houfe of commons had betrayed the rights of the people:" upon this he was called to order, and threatened to be fent to the Tower; but another member, friendly to minifters, endeavoured to foften matters, and to affume that the honourable baronet had fpoken in the hurry of anger; which fir George denied, and faid he would always ufe the fame language when the fame fubject was difcuffed: and he added at another period of the debate, that he was as cool as he could be; "bring me," faid he, "to teft, and I the matter will re-word, which madnefs would gambol from; therefore, ftanding in my place, as member for the county of York, I do declare, that this houfe of commons has betrayed the rights of the nation." On this, Mr. Fox replied in a very fhort fpeech, "That the licence gentlemen had taken in their language yefterday and to-day, feemed as if the old decent freedom of debate was at an end, and that they were endeavouring to eftablifh new forms." He then explained away much of the force of the addrefs and of his majefty's fpeech, which gave Mr. Burke the opportunity of faying, by way of a clofe to the difcuffion, "that it was not what we meant, but how the people out of doors would take it; however, he was glad to hear that the houfe meant nothing by their addrefs." Thefe facts are introduced to fhew that Mr. Fox began his parliamentary career by defending and juftifying the meafures of lord North's adminiftration; yet he was never that violent party-man, on this fide, fuch as he has been reprefented: he feems to have taken no lead whatever, and no part in many of the weighty difcuffions agitated at this period. The reporters of the parliamentary debates for that feffion did not look to him as a man of much confequence in the fcale; for in mentioning a motion made by Mr. Welbore Ellis, and which was feconded by Mr. Fox, they only fay "Mr. C. Fox feconded the motion in a lively, academical manner, of ftating and taking off arguments ufed in favour of the bill;" while to every other fpeaker on the occafion, many of whofe names have long fince been buried in everlafting oblivion, they have affigned comparatively large portions of their work to difplay the arguments. Early in the next feffion of parliament we find him juftifying the conduct of minifters: ftill he is only reprefented as "difplaying great ingenuity, in endeavouring to confound the reafonings of his opponent, and moving the previous queftion." But on a fubfequent day, December 6, when Mr. Serjeant Glynn moved "That a committee be appointed to inquire into the adminiftration of criminal juftice, and the proceedings of the judges of Weftminfter-hall, particularly in cafes relating to the liberty of the prefs, and the conftitutional power and duty of juries," Mr. Fox fpoke decidedly againft the motion; as he did on fome other occafions, for which, no doubt, he was in after-life afhamed. On the 27th of February 1771, on a difcuffion of the *nullum tempus* act, as it referred to the claims of fir James Lowther, Mr. Fox burft forth in a ftrain of manly eloquence, "I take fhame to myfelf," fays he, "that I have not rifen fooner to declare my fentiments on this important queftion; for I think it difgraceful in any man to fit filent on fuch an occafion, who ever had the ufe or faculty of fpeaking in this houfe: but, fir, my filence was owing to my aftonifhment; I was amazed! I was confounded! for, though I faw this bill at firft in the fame light in which I now behold it, yet I endeavoured to perfuade myfelf that I muft rather be miftaken, than that any thing fo bad, fo violent, fo lawlefs, fo monftrous, could be advanced by fuch men as thofe who propofed this bill. But I could not long remain undecided; I foon beheld the propofition in all its naked, genuine deformity: then, fir, as I was firft ftruck dumb with aftonifhment, I was feized with horror and indignation. Who, fir, that has a confcience to revere juftice, a fenfe of liberty, or a regard for the conftitution, can liften, without feeling an honeft zeal to defeat a propofition which, at one blow, deftroys our conftitution, our liberty, and our laws! Gentlemen are loud in their clamours againft minifterial influence. I avow the fyftematic fupport of that minifter in all his meafures, who has my good opinion and confidence; but that minifter fhall never have my affiftance and fupport, who fhall dare to propofe what thefe gentlemen, who are fo proud of their oppofition to minifters, now propofe." After this open and unreferved avowal in favour of the courfe purfued by lord North, it was to be expected he would not be long unnoticed; accordingly, we find him in a very fhort time advanced to a feat at the admiralty board, which he occupied a few months only, when, from caufes not diftinctly known, he refigned his office; but towards the end of the year 1772, or early in the following year, he was appointed one of the lords of the treafury. On this occafion he was violently affailed as a placeman, bound to vote for every meafure that the minifter might propofe; he denied the charge, avowing himfelf a free man, and that he would never fupport the meafures of government longer than while he believed they were calculated to promote the welfare of the Britifh empire; and opportunities were not wanting in which he exercifed this right. Of thefe, not the leaft memorable occurred during the debate on the bill brought into the houfe of commons by that excellent man fir William Meredith, to give relief from fubfcription to the thirty-nine articles. On this occafion Mr. Fox voted againft the minifter, and delivered an admirable fpeech in favour of religious liberty: and to the principles which he then avowed, he firmly and uniformly adhered to the laft hour of his life. Mr. Fox was no longer in high favour with the minifter, but he ftill gave him his general fupport and vote, though he had a mind fuperior to go all the lengths of a party-man: he muft at all times think for himfelf, and fometimes, as we have feen, he claimed to act according to his own judgment, which is ill relifhed by a man whofe motto muft be "aut Cæfar aut nullus." Mr Fox's immediate removal from the treafury was not owing to any oppofition to lord North's meafures, but to a difference of opinion as to the beft mode of carrying them into effect. The mifunderftanding arofe refpecting the committal of Mr. H. S. Woodfall, the printer of the Public Advertifer, who had been brought to the bar of the houfe for inferting a letter fuppofed to have been written by the Rev. J. Horne, now J. Horne Took, in which moft unjuftifiable liberties had been taken with the character of the fpeaker, fir Fletcher Norton. Mr. Woodfall having given up the author, and thrown himfelf on the mercy of the houfe, it was moved by Mr. Herbert that he fhould be committed to the cuftody of the ferjeant at arms. Mr. Fox, at that period a great ftickler for the privileges of the houfe, avowed that the punifhment was not fufficiently fevere, and moved "that he be committed to Newgate, as the only proper place to which offenders fhould be fent; though hints," he faid, "had been thrown out that the fheriffs would not admit him." To this lord North replied, that he was very forry (he undoubtedly meant *angry*) that hints had been thrown out of what the fheriffs would do; he hoped there were no perfons who would difpute the power of that houfe;

houfe; he therefore moved that the printer be committed to the Gate-houfe, as he thought it imprudent to force themfelves into a conteft with the city. Mr. Herbert carried his motion in oppofition to the others, by a majority of 152 to 68, to the great difpleafure of lord North, who afferted that it was entirely owing to the interference of Mr. Fox that he was left in a minority.

It was on the occafion of Mr. Horne's examination and triumph on this fubject, that colonel Barré feized the opportunity of widening the breach between the minifters, by farcaftically jeering the premier with want of fuccefs in the bufinefs; "At the firft commencement of this bufinefs," faid the colonel, "I augured that it would end ill, and I laft night felt inconceivable pain for the noble lord; his troops were no more prepared to defend than to fight for him. I know fome little matter about the arrangement of troops, but in my life I never faw a body of regulars cut fo wretched a figure! The noble lord has been charged with what I never fhould have fufpected him guilty of, a precipitancy. I hope he will take his fpirited friend's advice (Mr. Fox) and learn a little caution. Advice, whether coming from a grey or a green head, if good, fhould be followed." And again, "We have heard a deal of found law; I wifh we had a little more found fenfe from the other fide of the houfe. I have every thing to hope from the noble lord; he is at prefent moft happily fituated, for if he wants law, he has but to look at the left (to Mr. Wedderburne); if he ftand in need of common fenfe, his fpirited friend on the right (Mr. Fox) can abundantly fupply him."

This was on the 17th of February 1774, and in two days afterwards, while he was actually engaged in converfation with his lordfhip on other fubjects in the houfe of commons, he received the following laconic, and, as he deemed it, contemptuous epiftle, by the hands of one of the meffengers of the houfe.

"His majefty has thought proper to order a new commiffion of treafury to be made out, in which I do not fee your name.

North."

Mr. Fox in a fhort time entered avowedly the lifts of oppofition to the minifter. Sometimes, indeed, when the privileges of the houfe were concerned, he voted with the majority, yet he never failed to make him feel the power of his eloquence, and at length raifed fuch a force againft him as to fubvert his power, and almoft to bring him to condign punifhment. Mr. Fox had never given his voice for the coercive meafures that were at this period adopted with regard to America; on this fubject he was always confiftent, always the friend of liberty, and of the rights of our tranfatlantic brethren. To the firm ftand which he now took may be afcribed the foundation of that reputation which has been fo beneficial to his country, and which has immortalized his name. He commenced his oppofition in the midft of circumftances which enabled him to forefee and foretel the impending calamities of the public, and that with an inftantaneous decifion which excited in his hearers a confidence in the refolutions of his enlightened mind. For fome years the adminiftration had been rendered an object of popular jealoufy, owing to the uniform exclufion of the whig intereft from any fhare in the government: the influence of the crown had increafed, and had been perpetually fet in competition with the interefts of the people. A number of oppreffive ftatutes, enacted againft the interefts, and contrary to the confent of the colonies in America, had alienated the affections of their inhabitants, and juft apprehenfions were excited of a civil war which was likely to endanger the fafety of the whole empire. Notwithftanding a majority in parliament was for coercive meafures againft the Americans, defpondency fpread itfelf over the country, and the public credit, as was evident from the ftate of the funds, began rapidly to decline. In this ftate of things, Mr. Fox joined the oppofition, among whom were a Burke, a Camden, a Barré, and a Dunning, and at their head ftood the virtuous and enlightened marquis of Rockingham. Mr. Fox now began to take the foremoft rank among the fpeakers of the houfe: his vaft and comprehenfive mind foared beyond all his contemporaries; it embraced, as it were, intuitively, all fubjects, and the habit of profound reflection had given him a degree of prefcience which feemed almoft fupernatural. His deep penetration, and his knowledge of caufes and effects, were indeed greatly beyond that of any other man of the age: he viewed things in their diftant relations and their remote confequences. The experience, the fatal experience of an American and French revolution, has fhewn that there was fcarcely any great political meafure which he reprobated that was not ultimately found mifchievous in its operations; and hardly any line of conduct which he advifed, that time did not prove to be that which ought to have been purfued. "But his remonftrances, his exhortations and fuggeftions, like the predictions of Caffandra, to which they were often compared, were neglected and defpifed till the time in which they might have been executed had glided away." Thus, early in the year 1774, he oppofed the introduction of the Bofton Port bill, and apologized for the conduct of the colonifts; and on this and other occafions he arraigned the proceedings of the minifter in bold and energetic language: on the motion to repeal the tea act, April 17, he averred that this and other fimilar bills had been brought in with the view to irritate, and declare war in America, "which," fays he, looking to the treafury-bench, "if you perfift in, I am clearly of opinion you will effect, or force it into open rebellion." It was now that the minifter began to calculate the lofs he had fuftained, and the oppofition to eftimate the ftrength it had acquired. The reflecting part of the nation were animated, and openly rejoiced to behold, in the perfon of a youthful fenator, whom they had heretofore looked on as an enemy, a firm, intrepid advocate of the rights of the oppreffed. On the 22d of June the parliament was diffolved; one of its laft, or rather its laft act, was the Quebec bill, which was oppofed by Mr. Fox, and which was faid in the houfe to contain, among others equally abfurd, the following propofitions, *viz.* "That a ftate of flavery is better than a ftate of freedom:—that the popifh religion was more congenial to the principles of Chriftianity than the proteftant:—that juries are unneceffary, and therefore to be difufed:—that French laws are preferable to Englifh; and that the conftitution, which our anceftors had preferved with fo much wifdom, and eftablifhed at the expence of fo much blood and treafure, is to be deftroyed." The act was however paffed, and the parliament diffolved; and upon the affembling of a new parliament Mr. Fox appeared in his place, as member for the fame borough of Midhurft, pledging himfelf to ufe every effort in bringing the minifter to anfwer for the mifchief occafioned by his incapacity. It was on this occafion that colonel Barré characterized the late parliament as having "began their political life with a violation of the facred right of election in the cafe of Middlefex; they had died, he faid, in the act of popery, when they eftablifhed the Roman catholic religion in Canada, and they had left a rebellion in America as a legacy."

During the interval between the two parliaments, *viz.* in

in July 1774, lord Holland died, bequeathing Mr. Fox, who by the death of his brother Henry was now a fecond fon, large property, and confiderable eftates in the Ifle of Thanet. At Kingfgate he had left him a houfe, built in imitation of Cicero's Formian villa on the coaft of Baiæ. Mr. Fox, who had never been an economift, foon diffipated the property bequeathed him by his father, and fold Mr. Jenkinfon, the late lord Liverpool, a finecure place which had been obtained for him. Forlorn as his fituation now was, and brought on by his own extravagance, or by his inclination for gaming, his mind did not bend under the calamity; it feemed to rebound from the fall, and inftead of finking in defpair, to have actually rifen into celebrity and even independence. Without following him ftep by ftep in his illuftrious career, we may obferve generally, that he fpoke and voted during the whole conteft in direct oppofition to a criminal fyftem, which, as it had been fondly and fallacioufly prognofticated, was to produce the unconditional fubmiffion of the colonies, and lay them proftrate at the feet of the mother country. At length all the evils that had been forefeen were realized. America declared herfelf independent: France joined in the conteft: the capture of Burgoyne and Cornwallis proclaimed the triumphs of liberty, and a new conflagration lighted in Europe, by the fire-brands that had been fcattered by the Britifh miniftry in another hemifphere, wafted the ftrength and exhaufted the refources of England.

At the general election in 1780, the family borough of Midhurft having fallen into different hands, Mr. Fox, confcious of his own powers, became candidate for the city of Weftminfter, in which, after a violent conteft, he fucceeded, though oppofed by the formidable intereft of the Newcaftle family, and by the whole influence of the crown. Being now the reprefentative of a great city, he appeared in parliament in a more dignified capacity, and acquired a confiderable increafe of confequence to his political character. In himfelf he was ftill the fame: he now neceffarily lived and acted in the bofom of his conftituents: his eafinefs of accefs, his pleafant, focial fpirit, his friendly difpofition and conciliating manners, which appeared in all he faid, and the good temper which predominated in all he did, were qualities that rendered him the friend and acquaintance, as well as the reprefentative, of thofe who fent him into parliament: his fuperior talents, and their powerful and frequent application to popular purpofes, made him beft known among political men, and gave him a juft claim to the title fo long applied to him, of "The man of the people."

The fubjects of debate in the new parliament afforded the oppofition fine opportunities for the difplay of their eloquence: they had ever been diftinguifhed for integrity and talent, and now they became formidable by an increafe of numbers. Minifters were affailed in the houfe by arguments which they could neither repel nor contradict, and from without they were overwhelmed by the clamours of an indignant people; till at length lord North and his adherents, confounded, overwhelmed, and almoft driven to defpair, were obliged to refign, and it was hoped that they would have been made really refponfible for all the mifchiefs and bloodfhed that had occurred during their calamitous adminiftration. The Rockingham party, however, contented themfelves with the defeat of their opponents. Mr. Fox obtained the office of fecretary of ftate for foreign affairs, and the marquis was nominated the firft lord of the treafury. The expectation of the nation was now raifed to the higheft pitch: with this party, they hoped to fee an end to national calamity, and the interefts of the country fupported and maintained in all quarters of the globe. Much indeed was performed by them confidering the fhortnefs of their adminiftration. Though they had fucceeded to an empty exchequer, and a general and moft calamitous war, yet they refolved to free the people from fome of their numerous grievances. Contractors, thofe dead weights in the fcale of corruption, were excluded by act of parliament from the houfe of commons: cuftom and excife officers were difqualified from voting at elections: all the arbitrary proceedings with refpect to the Middlefex election were refcinded; while a reform bill abolifhed a number of ufelefs offices. A more generous policy was adopted in regard to Ireland: a general peace was meditated, and America, which could not be reftored, was at leaft to be conciliated. In the midft of thefe promifing appearances, the marquis of Rockingham, who was the fupport of the new adminiftration, fuddenly died, an event which afflicted the nation, and divided the friends of liberty. The council board was inftantly torn in pieces by political fchifms: a difpute, as had been forefeen, immediately took place refpecting the perfon who fhould fucceed as firft lord of the treafury. The candidates were lord Shelburne, afterwards marquis of Landfdowne, and the late duke of Portland; the former fuppofed to have the ear of the king, and a majority in the cabinet, was immediately entrufted with the reins of government, and Mr. Fox retired in difguft, declaring that "he had determined never to connive at plans in private, which he could not publicly avow." He now refumed his ftation in oppofition, and joined the very man whofe conduct he had for a feries of years deprecated as the moft deftructive to the interefts of his country, and moft baneful to the happinefs of mankind: while his former colleague, the earl of Shelburne, was bufied in concluding a peace with France, Spain, Holland, and the united ftates of America. This nobleman, though by no means deficient in political wifdom, had omitted to take thofe fteps which preceding minifters had ever adopted to fecure fafety. A confederacy was formed againft him by the union of the friends of Mr. Fox and lord North, known by the name of "The coalition," which proved in the event as impolitic, as it was odious to the great mafs of the people. It anfwered, however, the temporary purpofe of thofe who adopted it, by enabling them to fupplant their rivals, and to feize upon their places. Their fuccefs was, however, ephemeral; they had a majority in the houfe of commons, but the people at large were decidedly hoftile to an union which appeared to them to be bottomed on ambition only, and deftitute of any common public principle. It was afferted, with too much appearance of truth, that they agreed in no one great meafure calculated for the benefit of the country, and the nation feemed to unite againft them as one man. Their conduct in the cabinet led the fovereign to ufe a watchful and even jealous eye upon their acts; and the famous India bill proved the rock on which they finally fplit, and on account of which they forfeited their places. Mr. Fox had now to contend for the government of the empire with William Pitt, a ftripling fcarcely arrived at the age of manhood, but who neverthelefs fucceeded to the poft of premier, and maintained the fituation for more than twenty years.

The tide of popularity had fet in fo ftrongly againft Mr. Fox, that at the general election many of his moft active friends and partizans loft their feats in the houfe of commons, and he himfelf was forced into a long and expenfive conteft for the city of Weftminfter. He had, as we have feen, been originally returned for that place by the voice of the inhabitants, in oppofition to the influence of the crown

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united to that of some of the leading families. Now, though supported by the Portland and Devonshire interests, he had to maintain a severe and very dubious struggle, but after the lapse of forty-seven days he appeared, at the close of the poll, to have a majority of 236 votes in his favour. A scrutiny was demanded and obtained by his adversary, by which Mr. Fox would have been excluded for a time from the house of commons, had he not been returned by the interest of sir Thomas Dundas for some Scotch boroughs. At length his triumph was complete, the house of commons, after the scrutiny had continued from May to the following March, ordered the high bailiff to make his return, when the majority for Mr. Fox was 231, he having at this period lost only five by the investigation. At this election 12,301 electors polled, of whom 6126 gave their votes for Mr. Fox. A prosecution was commenced against the high bailiff; and a verdict was obtained, with 2000*l.* damages. From this period to his death, a long space of twenty-five years, Mr. Fox had been gradually rising in the estimation of his fellow citizens. He took an active and leading part in the prosecution of Mr. Hastings, a measure that seemed absolutely necessary to clear the honour of the nation, and to prove to the inhabitants of India, that in England they would still find avengers of their wrongs. Mr. Fox had ever shewn himself a friend to peace, as well from the true principles of humanity, as to promote the interests of his country; and on two great occasions his overbearing eloquence proved of the last importance to the nation; once when his rival, Mr. Pitt, at the instigation of the court of Berlin, wished to wage an unprofitable war with Russia, relative to the possession of Oczakow; the other, when he urged a contest with Spain. And it is now a matter of astonishment, that a minister who derived all his credit from the management of the finances, laboured to impoverish the nation by two ridiculous but bloody conflicts, one of which had for its object the preservation of the Turkish frontier, and the other a participation in the trade of catskins.

In the year 1788, Mr. Fox, disgusted or wearied with public business, repaired to the continent, and after spending a few days with Gibbon the historian, at Lausanne, entered the classic regions of Italy; scarcely had he time to look about him, when a messenger from the prince of Wales arrived, desiring his immediate attendance in forming an administration, which the king's alarming and singular illness rendered necessary. Mr. Fox returned, but on the first day of his appearing in the house, he started an abstract question upon the subject of the prince's *right* to the regency, which caused very violent and protracted discussions, till at length his majesty was restored to the possession of his health, and a regency rendered unnecessary. On this subject his rival contrived to take his stand on constitutional ground, which caused the opposition, with their leader, to lose rather than gain popularity by the measure.

No sooner had the French nation evinced a sincere desire to shake off the yoke of absolute power, than Mr. Fox hailed the auspicious dawn of rising liberty. At first the two great rival chiefs, who agreed in nothing else, united cordially in this cause, and while one presaged a long peace, the extinction of the national debt, and the prosperity of the empire; the other gloried in beholding a mighty people rescued from the most oppressive servitude, and at the same time augured the happiest results in favour of the human race. At length however, they became opposed to each other, and the most serious conflicts were the result of their discussions. Mr. Fox experienced the dereliction of many of his associates, among others of Mr. Burke, the man from whose lips he had first imbibed the principles of freedom.

This was a circumstance that affected him more than any other through life; he had seen his plans for the public good disappointed; he had been deserted by a crowd of political adherents; a thousand times his heart and his motives had been slandered, still he had abundant resources in himself to bear up against the tide setting in against him. No opposition, no injuries could excite in him the spirit of revenge, or the principles of acrimony; even "when his friend, on whom he hung with almost idolatrous regard, broke from him in the paroxysm of political madness, and with furious cruelty explored, in his attack on him, every avenue to pain, far from repelling enmity with enmity, he discovered his sensibilities of wrong only with tears, and he subsequently wept with a pertinacity of affection almost without example, over the sepulchre of that very man, who had unrelentingly spurned all his offers of reconciliation, and who, with reference to him, had expired in the bitterness of resentment."

War was commenced; to this, in every stage, Mr. Fox gave his decided negative, but Mr. Pitt, who was supposed to engage in it, at first, with reluctance, left no means untried to carry his measures with a high hand. Titles, offices, and honours were distributed with the utmost profusion, the opposition benches were nearly deserted, and his political rival, the subject of this memoir, was left almost alone to contend against a host of foes. Conscious of his integrity, and of the justice of the great principles on which he was acting, and at the same time seeing that his opposition was almost without effect, he determined to secede from parliament, and had evinced a wish to retire altogether from public business. But the entreaties of his friends, and the occurrence of new and singular events, prevented the measure. He again took his place in parliament at the head of an opposition, feeble in point of numbers, but formidable in respect to talents and abilities.

At length, after eighteen years, Mr. Pitt retired from office, and was succeeded by Mr. Addington, now viscount Sidmouth, who concluded the peace of Amiens, and who on this occasion received the support of Mr. Fox and his friends. When a renewal of the contest was meditated, he expressed himself hostile to the measure, avowing that he thought the continuance of peace was infinitely desirable, and that the preservation of national honour was the only legitimate cause of war. In strict consistency, therefore, with this notion, when the royal message was brought down to the house declaratory of hostilities, Mr. Fox expressed his opinion both against the war as unnecessary, and against the crisis at which it took place, as impolitic. This measure soon proved fatal to Mr. Addington's administration, and the reins of government having dropped from his hands, were immediately seized by Mr. Pitt. Mr. Fox now joined lord Grenville, and it was supposed an extended administration would have been formed, in which these gentlemen and their friends would have made a part. While however Mr. Pitt expressed his readiness, and even his anxious wish to comply with what was supposed the desire of the country, he, at the same time, hinted that insurmountable obstacles had occurred in a *certain quarter.* Scarcely had the discussions on this subject subsided, when Mr. Pitt, who had long been ill, sickened and died. A vote of parliament for a public funeral, and the payment of his debts at the expence of the nation, added to his sudden fate, and universally acknowledged talents, all tended to render his memory respected. His associates, after a short trial, gave way for the introduction of Mr. Fox once more into office. He re-

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fumed his fituation as fecretary of ftate for the foreign department which he had furrendered twenty-two years before. It could not be his wifh, at this period of his life, to embark on fo hazardous a voyage, yet at the call of his fovereign and his country he was willing to fpend the remains of life in their fervice. Aware that he had but a fhort fpace before him, he declared he fhould die contented and happy if he could but previoufly obtain peace, an honourable peace for Britain; remove all legal difabilities arifing out of religion in order to unite more clofely the interefts of Ireland with thofe of England; and laftly, obtain a complete abolition of the flave trade. Every eye was now directed towards him, and every mind anticipated the good effects of the meafures that they fondly hoped would, by his influence, be adopted. It was, however, a moft unfortunate circumftance, that his colleague, lord Grenville, already an auditor of the exchequer, infifted on being alfo firft lord of the treafury, offices which had heretofore been incompatible. Mr. Fox, to promote the union, fo defirable in the cabinet, vindicated their compatibility, but loft much credit for his good nature, in the country; nor was his fecond act better relifhed, *viz.* of inviting the lord chief juftice of the king's bench to a feat in the cabinet; thefe were regarded as unconftitutional meafures, and violent clamours were raifed againft him, as introducing precedents moft fatal to the liberties of the country. The preliminaries being now arranged, one of his firft acts was a meafure for the reftriction of the flave trade, and by his means a folemn refolution was voted by the fenate, and carried up to the fovereign, on the juftice and policy, the duty and neceffity, of the total abolition of this abominable traffic. He declared, in one of the debates on this bufinefs, on behalf of himfelf and fuch of his colleagues as had voted with him on the fubject when out of office, that they felt the total abolition of the flave trade as a ftep involving the deareft interefts of humanity, and as one which, however unfortunate they might be in other refpects, fhould they be fuccefsful in effecting it, would entail more true glory upon their adminiftration, and more honour upon their country, than any other tranfaction in which they could be engaged. Scarcely had he commenced his career of public and official bufinefs, in which his country and the world would have been benefitted, before the powers of his body funk exhaufted by the too vigorous exertions of his mind; and the immenfe preffure of public concerns broke down a conftitution which had previoufly indicated fymptoms of decay, and in a few months deprived his country of the moft enlightened and patriotic ftatefman which this, or any other nation could boaft, before the mighty fchemes revolving in his breaft could be matured and developed, and almoft before any one of his wife and falutary plans could be carried into effect. Had he lived but a year, or even a few months longer, he might probably have reftored peace to a diftracted world; he might, had he not been thwarted and oppofed by his colleagues, fome of whom could not poffibly enter into his feelings, nor comprehend the grand motives of his actions, have reftored the conftitution of Britain to its ancient fplendour, by an annihilation of the difgraceful traffic in the reprefentation, and by expunging from the ftatute book thofe modern acts which disfigure and difgrace it. He died Sept. 13, 1806, without pain and almoft without a ftruggle, in the 58th year of his age. It happened to few men, if to any, to leave fo many forrowing friends; his deceafe was the fubject of univerfal lamentation, and the general regret which took place when the event was announced, and which followed him to his grave by the myriads who affembled to teftify their refpect to his memory, fpoke more powerfully of the merits and claims of Mr. Fox than language could defcribe. Neverthelefs the pulpit and prefs were made ufe of by the clergy of all denominations, and by perfons of different, and even oppofite political parties, to illuftrate his virtues and celebrate his well earned fame. Many of the characters drawn of this great man have been collected in a volume by one of the moft learned men of the age, who affumes the title of "Philopatris Varvicenfis." Of this work we have already made much ufe in the courfe of the foregoing article, and to feveral parts of it we fhall be ftill more indebted for the following delineation of Mr. Fox's character.

"To an extraordinary natural capacity, improved and embellifhed by a liberal education, and to a quicknefs of apprehenfion which inftantly feized every object that was prefented to it, and which with incredible facility developed the moft intricate problems, this great man added a memory richly ftored with the treafures of fcience and literature, and well fraught with hiftorical and political knowledge. He was profoundly verfed in the hiftory and the conftitution of his country. He perfectly underftood its external relations, its connection with foreign powers, its political and commercial interefts, its financial refources, its military and naval ftrength. He was well acquainted with the hiftory, the ftrength, the policy, the feparate and relative interefts and views of thofe ftates which once conftituted what has not been improperly called the great republic of Europe; and upon the juft equipoife of the political power and influence of which the liberty, fafety, and profperity of the whole was fuppofed to depend. And, in a word, he was ignorant of nothing which was neceffary to conftitute the confummate ftatefman. To this was added an extent of views, a comprehenfion of mind, and an energy of character peculiarly his own. All thefe were combined with a philanthropy, which originated in a natural goodnefs of heart, improved and extended by hiftorical knowledge, and perfonal obfervation, of the ineftimable bleffings which refult from civil liberty, and from a wife adminiftration of government, and of the miferies which accrue to mankind from unjuft wars, from tyranny and perfecution; and confirmed by generous exertions in defence of the injured, infulted, and oppreffed: fo that what was originally nothing more than a natural bias of the mind, became by degrees a moral principle, and grew up into a fixed habit of univerfal, active, and difinterefted benevolence. His eloquence, that divine eloquence, which aftonifhed and captivated the world, confifted, not in pomp of diction nor in melody of found; not merely in a happy felection of expreffions, though the beft and the moft appropriate which the language could fupply fpontaneoufly offered themfelves to his ufe; not in dazzling the fancy with brilliant imagery; not in bewildering the underftanding with plaufible fophiftry; not in flattering the prejudice of his hearers, nor in exciting falfe hopes or groundlefs terrors to render them blindly fubfervient to party purpofes:—to fuch unworthy artifices his manly fpirit difdained to ftoop. His eloquence was of a nobler kind. Plain, nervous, energetic, vehement: it fimplified what was complicate, it unravelled what was entangled, it caft light upon what was obfcure, and through the underftanding it forced its way to the heart. It came home to the fenfe and feelings of the hearer; and by a fecret, irrefiftible charm, it extorted the affent of thofe who were moft unwilling to be convinced. And to crown all, this aftonifhing eloquence was uniformly exerted in the caufe of liberty and juftice, in defence of the oppreffed and perfecuted, and in vindicating the rights, the freedom, and the happinefs of mankind.

"Never

"Never, during the whole of his long parliamentary life, was his voice lifted up to juftify oppreffion or perfecution: never did the injured or oppreffed appeal to the Britifh fenate, that he did not exert his noble eloquence on their behalf. He made the caufe of all that were wronged his own; and, even where he failed, through the perverfenefs of the times, of procuring juftice for them, he in a meafure compenfated their fufferings, by lending his great talents to their caufe, and by drawing towards it the fympathy of mankind. In him, the moft difcordant fects, and the moft diftant provinces, found an ever ready defender and a generous patron. He pleaded (and with what ftrength of argument, what rich variety of illuftration, what dignity of fentiment, what majefty of diction!) for the equitable privileges of the Roman Catholic and the Proteftant diffenter; and he contended, with an eloquence alternately indignant and pathetic, for the rights of the harafled Irifh, the oppreffed Hindoos, and the fuffering Africans.

"The various opinions which Mr. Fox delivered, during the long courfe and diverfified conflicts of his public life, contain a treafure of political philofophy, which no ftatefman can ftudy without becoming more benevolent and more wife. The notions which he uttered were not taken up at random, and again laid down without confideration, as intereft or paffion might impel. Such may be, and fuch are, the fluctuations of thofe who venture on the fea of politics, without fagacity to direct their way, or honefty to keep them fteady in their courfe. The axioms which Mr. Fox embraced as the pole-ftar of his political conduct, and which he inculcated as the beft means of promoting the happinefs of nations, were deduced from a profound and comprehenfive furvey of human affairs, from an intimate acquaintance with human nature, and from an enlightened view of the end for which government was eftablifhed. His political fentiments, originating in principles which are as immutable as the attributes of the deity, from which they are derived, were not fubject to any vicious defection or capricious fluctuations. Though Mr. Fox was no formal religionift, yet the effence of religion, which centres in charity, was the predominant fenfation of his heart. If religion confift in doing to others as we would that they fhould do to us; if it have any connection with a holy endeavour to preferve peace on earth, and good will among men, (and what Chriftian will deny this?) then we will venture to fay, that Mr. Fox, who never made any fhew of religion, was, in fact, one of the moft religious men of the age. The great object of his political life was to prevent the havock of war, and to preferve the world in peace. His exertions were indeed ineffectual, but they were unintermitted; and if he who faves the life of one man deferves a civic crown, what recompence muft be due to him who laboured, with fo much conftancy and zeal, to refcue millions from an untimely grave? If peace, fince the commencement of the Chriftian era, ever had a fteady, a difinterefted advocate, it was in Mr. Fox. Peace was his conftant aim, his ardent hope, his living counfel, and his dying prayer."

Mr. Fox muft now be confidered as an author. While at Eton, his compofitions were highly diftinguifhed, fome of which are in print; as one compofed in or about the year 1761, beginning, "Vocat ultimus labor;" another, "I, fugias, celeri volitans per nubila curfu," written in 1764; and his "Quid miri faciat Natura," which was followed by a Greek dialogue in 1765. See Mufæ Etonenfes, &c.

Mr. Fox is author of the 14th, 16th, and perhaps, fays the prefent lord Holland, his nephew, a few other numbers of a periodical publication in 1779, called the Englifhman.

In 1793, he publifhed "A Letter to the Electors of Weftminfter," which paffed through thirteen editions within a few months. This pamphlet contains a full and ample juftification of his political conduct, with refpect to the difcuffions in which he had engaged on the French revolution.

It does not appear that the parliamentary fpeeches, printed feparately as his, of which there are many, were ever revifed by him, but were taken from the public papers. But "A Sketch of the Character of the late moft noble Francis Duke of Bedford, as delivered in his introductory Speech to a Motion for a new Writ for Taviftock, on the 16th of March, 1802," was printed by his authority, and from his own manufcript copy; and it is faid, that he obferved on that occafion, "that he had never before attempted to make a copy of any fpeech which he had delivered in public." Since this, he wrote an epitaph on the late bifhop of Downe, which is engraved on his tomb, in the church of St. James, in the Hampftead road. "There are," fays lord Holland, "feveral fpecimens of his compofition in verfe, in different languages; but the lines on Mrs. Crewe, and thofe on Mrs. Fox, on his birth-day, are, as far as I recollect, all that have been printed." An ode to Poverty, and an epigram upon Gibbon, though very generally attributed to him, are certainly not his compofitions.

To lord Holland, however, the world is indebted for an important and fingularly valuable pofthumous publication of this great ftatefman, entitled, "A Hiftory of the early Part of the Reign of James the Second, with an introductory Chapter," &c. It is not known when he firft formed the defign of writing a hiftory; but in the year 1797, he publicly announced in parliament his intention of devoting a greater portion of his time to his private purfuits: "After feeing," fays he, "the conduct of this houfe, after feeing them give to minifters their confidence and fupport, upon convicted failure, impofition, and incapacity; after feeing them deaf and blind to the confequences of a career that penetrates the hearts of all other men with alarm; and that neither reafon, nor experience, nor duty, are fufficiently powerful to influence them to oppofe the conduct of government, I certainly do think that I may devote more of my time to private purfuits, and to retirement which I love, than I have hitherto done." When he had determined to confecrate a part of that time in writing hiftory, he was naturally led, from his intimate knowledge of the Englifh conftitution, to prefer the hiftory of his own country, and to felect a period favourable to the general illuftration of the great principles of freedom on which it is founded. With this view, he fixed on the revolution of 1688, as being the moft fignal triumph of that caufe to which his public life had been devoted; and alfo, with the defire of refcuing from mifreprefentation the moft glorious tranfaction of our hiftory; of inftructing his countrymen in the real nature of their conftitution, and of impreffing on mankind thofe leffons applicable to all times, which are to be drawn from that memorable occurrence. It is to be lamented that the author had made fo little progrefs in this work, when he was called to take a principal part in the government of the country. The volume comprehends only the hiftory of the tranfactions of the firft year of the reign of James II., with an introductory chapter on the character and leading events of the times immediately preceding. Short, however, as this fragment is, yet the advantages refulting from it are numerous and important. It contains a picture, drawn with a mafterly hand, of the practical tyranny that was exercifed over this nation, under the

the reigns of Charles II. and James II.; which ſhews, that had affairs proceeded, for a ſhort time only, in the ſame courſe, the forlorn and deſolate aſpect of deſpotiſm muſt have been permanently impreſſed upon the country: it likewiſe exhibits a mournful picture of that ſervile ſubmiſſion, which then ſeemed to form the character of the nation, and to point them out as the willing victims of oppreſſion: and it ſtigmatizes thoſe time-ſerving and bigotted hiſtorians, who have endeavoured to diſguiſe the enormities of that period; to write the apology of venality and deſpotiſm; to repreſs the virtuous emotions of hatred and indignation, which the ſcenes then paſſing are calculated to excite; and who have contributed ſo largely to corrupt the moral ſentiments of our people, and extinguiſh among us the love of our country, and a diſintereſted courage in public affairs. Engliſh Peerage. Parliamentary Debates. Hiſtory of the early Part of the Reign of James II., &c. &c.

Fox de Morzillo, Sebastian, a Spaniſh philoſopher and man of letters, was born at Seville in 1528, and purſued his ſtudies partly in his own country and partly in the Netherlands. He began to attract the notice of the learned world by his literary productions ſoon after he was twenty years of age; and in a ſhort time acquired ſo high a reputation, that Philip III. fixed upon him as a fit perſon for the office of preceptor to the Infant Don Carlos. When he was nominated to this high charge, he was a reſident at Louvain; but, on its being notified to him, he inſtantly prepared to return to Spain by ſea. The ſhip in which he embarked was unfortunately wrecked, and he periſhed in the morning of life. The principal works which he left behind him were, "De Studii Philoſophici Ratione;" "De Uſu et Exercitatione Dialecti;" "De Honore;" "De Juventute;" "De Regno et Regis Inſtitutione Lib. iii." Moreri.

Fox, in *Engineery*, ſometimes ſignifies a heading, or ſough underground. See Smeaton's Reports, i. 48.

Fox, in *Geography*, a town of Peru; 9 miles E. of Lopes.

Fox *Iſland*, an iſland near the weſt coaſt of Ireland; 7 miles E. of Slyne head.—Alſo, an American iſland, near the coaſt of Main. N. lat. 44° 2′. W. long. 68° 40′.

Fox *Iſlands*, a group of iſlands between Kamtſkatka and America, forming a part of the chain called the *Aleutian* iſlands, which ſee. Theſe conſtitute, according to the arrangement of Mr. Muller, the fourth claſs of iſlands lying between Kamtſkatka and America; the other three claſſes being the *Saſignes*, comprehending ſix iſlands, *viz.* Behring's and Copper iſlands, and the neareſt Aleutians, of which Otma, Semia, and Anatto are moſt eminent; and *Chao*, comprehending eight iſlands, *viz* Immak, Kiſka, Tſhetgina, Ava, Chavia, Tſhagulak, Ulagabma, and Amtſhigda, or the more diſtant Aleutians; and *Negho*, containing what are called the Andreanofskiye iſlands, ſuch as the ſixteen following, *viz.* Amatkineg, Ulek, Unalga, Navotſha, Uliga, Anægin, Chagulak, Illaſhe, Tekavanga, Kanaga, (which two are remarkable for burning mountains,) Lek, Shetſhuna, Tagalukos, behind which follow ſome uninhabited little rocks and iſlands, one of which, on account of its black cliffs, is called by the Ruſſians Goreloi (the burnt), and laſtly, Atſhak and Amlak. The fourth claſs, or Fox iſlands, called *Kavalang*, comprehend the following ſixteen; *viz.* Amukta, Tſhigama, Tſhagula, Uniſka, Ulaga, Tanagulæna, Kagamin, Kigalga, Shalmaga, Unmak, Agua-Alæſka or Unalaſhka, Unimga or Unimak, toward which a point of land from the continent of America, with a few circumjacent iſlands, is ſaid to project; and beyond this point are Uligan, Autun-Duſſuma, Semedit, and Senegak, whence perhaps Kadiak was formed. The Andreanofskiye and Fox iſlands are in general as mountainous as the Aleutian and Behring's iſland. Their coaſts are rocky, and ſurrounded by breakers. The land riſes immediately from the coaſts to ſteep, bold, rock-mountains, gradually aſcending higher behind each other, and aſſuming the appearance of chains of mountains, with a direction lengthwiſe of the iſland, and having, commonly in the midway of the breadth, the higheſt ridges. Springs riſe at the foot of the mountains, and either flow in broad and rapid ſtreams into the neighbouring ſea; or collecting themſelves in the rocky vales and glens beneath, form ample lakes, which let off their ſuperfluous waters by natural canals into the adjacent bays. Several of theſe iſlands, where at preſent no ſmoking volcano is any longer diſcernible, as Ayak and Tſhetekina, ſeem anciently to have had them, as their traces are ſtill to be ſeen in the ſulphureous boiling ſources that are met with at various intervals. On Tatavanga and Kanaga, among the Andreanofskiye iſlands, and again on Umnak, on the great iſland Unalaſhka, and on Unimga, among the Fox iſlands, are ſtill active volcanoes, which continually emit ſmoke, and from ſome of them frequently iſſue flames. No traces of metals have ever yet been deſcried on theſe volcanic iſlands. But carneoles and ſardonyxes are brought from them. The ſoil of theſe iſlands is ſaid to reſemble that of Kamtſkatka; the ſame kinds of edible wild berries and roots have been found there, excepting ſome few vegetables which ſeem to be of foreign produce. Beſides creeping twigs of willow, larches, alders, and birch, which ſeem as little as on the ſnow mountains, no wood has been perceived on theſe iſlands, Radiak excepted. On Unalaſhka, however, in ſome deep holes, a ſmall quantity of wood ſhoots up. But the ſea wafts all ſorts of floating timber to their ſhores. On the Fox iſlands they have an extraordinary number of foxes, black and grey, as well as red and brown. Here are alſo bears, wolves, river-otters, river-beavers, martins, and ermines, which ſeem to have come over from America. The ſea-otter is frequently caught here. Their ſeas abound in all ſorts of ſeals, dolphins, and whales; ſea-lions and porpoiſes are rare, and ſea-cows not at all to be ſeen. The water-fowl or fiſh are the ſame as at Kamtſkatka. The winter is tolerably mild, but the ſummer equally ſhort and unpleaſant. Theſe iſlands are pretty well peopled; the inhabitants moſtly pay tribute to Ruſſia, and drive a bartering trade with the Ruſſian mariners, who go thither on account of the very profitable chace of ſea-otters and foxes. They are, however, not always to be truſted, as no ſmall number of Ruſſians have experienced to their coſt, having been robbed and murdered by theſe ſavages. Tooke's Ruſſ. Emp. vol. i.

Fox *Iſlands*, are alſo a ſmall cluſter of ſmall iſlands on the ſouth ſide of the gulf of St. Lawrence. N. lat. 51°. W. long. 59° 10′.

Fox *River*, a river of Canada, which runs into the gulf of St. Lawrence; 9 miles N.N.W. of Cape Roſieres.—Alſo, a river of North America, which forms a communication between Green bay in lake Michigan, and lake Winnebago. For four or five miles from the bay the river has a gentle current; then, till you arrive at the Winnebago lake, it is full of rocks and very rapid, ſo that it is neceſſary at many places to land the canoes, and carry them for a conſiderable interval. Its general breadth from the Green lake to Winnebago lake is between 70 and 100 yards; the land on its borders is very good, and thinly wooded with hickery, oak, and hazel. The Attigaumies and Saulies once inhabited the banks of this river. The mouth lies W. long 87° 53′. N. lat. 43° 48′.—Alſo, a river of Canada, which runs

runs into lake Michigan. N. lat. 43° 30'. W. long. 87° 20'.—Alfo, a river of the weftern territory of America, which runs into the Theakiki. N. lat. 41° 28'. W. long. 87° 58'.—Alfo, a river of the weftern territory of America, which runs into the Wabafh. N. lat. 38°. W. long. 88° 33'.

Fox's *Tram-road*, in Glamorganfhire, is one of the numerous feparate eftablifhments for improved communication which have arifen of late years in South Wales. Of this tram road we were uninformed at the time of compiling the general alphabetical account of fuch eftablifhments affixed to our article CANAL; it commences in Neath river, at Neath town, and croffing the public bridge by the fide of the carriage way, (a fingular inftance,) proceeds one mile to Neath Abbey iron furnace, to the foot of the fteep plane for horfes, 200 yards long and 70 feet rife, which afcends to the bridge-loft, whence the furnace is charged with ore, coak, and lime-ftone.

Fox, in *Sea Language*, fignifies a fort of ftrand, formed by twifting feveral rope-yarns together, and ufed as a feizing, or to weave a mat or paunch, &c.

Fox, *Vulpes*, in *Zoology*, an animal of the dog-kind; much refembling the common dog in form, and of the fize of the fpaniel. It is chiefly diftinguifhed by its long, ftraight tail, with a white tip to it. See VULPES.

It differs, however, from the common dog in the length, denfe difpofition, and foftnefs of the hairs, efpecially thofe about its tail, which is bufhy, much admired by the animal itfelf, and in cold weather wrapped round its nofe; and in its fmell, which is peculiarly rank and difagreeable. The fmell of its urine is remarkably fœtid; infomuch that the animal covers it in the earth. It is faid that the fox makes ufe of its urine as an expedient to force the cleanly badger from its habitation; however, it makes ufe of the badger's hole. Its ufual colour is a reddifh tawny, though it is fometimes found white, and fometimes black. Its fore-feet and tops of the ears are black; the ears are erect, and the lips are white. Its manner of digging itfelf a hole in the earth is alfo a cuftom wholly different from that of all the dog-kind; and it is far from the tamenefs of that animal, being with difficulty made to lofe its fiercenefs. Of all animals the fox has the moft fignificant eye, by which it expreffes every paffion of love, fear, hatred, &c.

The fox is a crafty, lively, libidinous animal; it breeds only once a year, unlefs fome accident befalls its firft litter, and brings four or five young, which, like puppies, are born blind.

The fox is the Αλωπηξ of Ariftotle and Ælian, and the Κερδω of Oppian. It inhabits Europe, Afia, Africa, and America, as far as Chili, and accordingly is a native of moft northern countries; and there are three varieties of it, differing a little in form but not in colour. They are diftinguifhed in Wales by different names. The greyhound fox is the largeft, talleft, and boldeft, and will attack a grown fheep or wether: the maftiff fox is lefs, but more ftrongly built; the cur fox is the leaft, lurks about hedges, outhoufes, &c. and is the moft pernicious to the feathered tribe. The firft of thefe has a white tip to the tail; the laft a black. The fkin of this animal is furnifhed with a foft and warm fur, which in many parts of Europe is ufed to make muffs and fine cloths.

A fox in the firft year is called a cub; in the fecond a fox, and afterwards an old fox. It is a beaft of chace, ufually very prejudicial to the hufbandman, by taking away and deftroying his lambs, geefe, and poultry. It will feed on flefh of any kind; and, when urged by hunger, eat carrots and infects, and the dung of other animals; and, near the fea-coafts, for want of other food, eat crabs, fhrimps, or fhell fifh. In France and Italy it does incredible damage in the vineyards, by eating the grapes, of which it is very fond, and which make it fat; fo that at this time its flefh is reckoned good food. The fox is a great deftroyer of rats and field animals. It fecures its booty by digging holes in feveral places; and if a whole ftock of poultry fhould happen to be its prey, will bring them one by one, thruft them in with its nofe, and conceal them by ramming the loofe earth upon them, till the calls of hunger induce him to devour them. It does not readily commit thefts in the neighbourhood of its own haunts. It is much terrified by fire-arms, flies from the fmell of gunpowder, and may be chafed away by means of fmoke. The common way to catch him is by gins, which being baited, and a train made by drawing raw flefh acrofs his ufual paths or haunts to the gin, it proves an inducement to allure him to the place of deftruction. They are alfo taken with greyhounds, hounds, terriers, and nets; it is a commendable exercife to hunt thefe mifchievous beafts, the nature of which, in many refpects, is like that of wolves. See HUNTING.

Fox, *Antarctic*, *C. Vulpes Auftralis*, Coyotl, or Indian fox, Fernand. Mex. Wolf-fox, Borgainville, has the tail pendent, bufhy, and tipt with white; the ears fhort, erect, and pointed. This animal inhabits America and Falkland iflands. It is about a third larger than the common fox, and has the habits of the wolf in the ears, tail, and ftrength of limbs. In Falkland's iflands it lives near the fhore, kennels like foxes, and has regular paths from one part of the fhore to another for furprifing the fea-fowl, on which it chiefly feeds. It is very tame, barks like a dog, and has a very fœtid fmell; the head and body are covered with woolly hair of a cinereous brown colour; the legs are dafhed with ruft-colour. The tail is dufky; and the infides of the ears are lined with white hair.

Fox, *Arctic*. See LAGOPUS.

Fox, *Black*, *C. Vulpes Lycaon*, refembles the wolf, and is of an intermediate fize between that animal and the fox. It has a ftraight tail, and the body is wholly black; fometimes variegated with greyifh, or having the tips of the hairs of a filvery whitenefs. It inhabits the coldeft regions of Europe, Afia, and America; and is reckoned the moft cunning animal of the genus. Its fur is deemed very valuable, being preferred in Ruffia to the fineft fables, one fkin fometimes felling for two roubles. Thofe of America are of inferior beauty.

Fox, *Brant*. See ALOPEX.

Fox, *Coal*. See ALOPEX.

Fox, *Corfac*, *C. Vulpes Corfac*, is diftinguifhed by its ftraight, tawny tail, which is black at the root and tip. This fpecies or variety is lefs than the common fox, but in other refpects is very fimilar to it. It is greedy of birds, has a bad fmell, and howls and barks like thofe of the common kind; the ears are upright, the hair is foft and downy; the tail is bufhy, and as long as the body; the fur is of a pale tawny colour in fummer, growing grey in winter, with a white throat; the tail is cinereous, except the bafe and tip. It chiefly inhabits the great defert between the Ural and the Irtifh, in Afiatic Ruffia. Forty or fifty thoufand of the fkins of this animal are annually fold by the Kirghis Coffacks to the Ruffians, being caught by means of falcons and greyhounds.

Fox, *Crofs*, *C. Vulpes Crucigera*, has a black crofs on the fhoulder; the fur is thicker and fofter than that of the common fox, and is reckoned valuable. It inhabits the coldeft parts of Europe, Afia, and North America.

Fox,

Fox, *Desert*, or *Karagan*, has a ſtraight tail, with the body of a grey colour, and black ears. It inhabits the deſerts belonging to the Kalmucks and Kirgiſes.

Fox-*hound*. See DOG and HOUND.

Fox, *Siberian*. See LAGOPUS.

Fox, *Silvery*, *C. Vulpes cinereo-argenteus*, has a ſtraight tail, the body of a ſilver-grey colour, and the ſides of the neck of a yellowiſh brown. This animal is ſmaller than the common fox, but agrees with it in figure and manners. It inhabits North America.

Fox, *Grey*, *C. Vulpes Virginianus*, has a ſtraight tail, and the body of a whitiſh-aſh colour. This ſpecies inhabits Carolina, lives in the hollow trunks of decayed trees, and is eaſily tamed.

Fox, *Sea*, *Vulpes marina*, in *Ichthyology*, the name given by authors to a large fiſh, called the *ſea-fox* by us. In the Artedian ſyſtem it is the ſqualus, with a tail longer than the body. See SQUALUS *Vulpes*.

Fox-*glove*, in *Botany*, the common name of a large well-known plant. See DIGITALIS.

Fox-*tail Graſs*, the common name of a valuable ſort of natural meadow graſs. See ALOPECURUS and GRASS.

FOXBOROUGH, in *Geography*, a townſhip of America, in Norfolk county, and ſtate of Maſſachuſets; 26 miles S. of Boſton: incorporated in 1778, and containing 779 inhabitants.

FOXERNA, a town of Sweden, in Weſt Gothland; 24 miles N. of Gothenburg.

FOXFORD, a ſmall poſt town of the county of Mayo, Ireland, ſituated on the river Moy, and about two miles from Lough Conn. It is 113 miles W. by N. from Dublin, and eleven from Caſtlebar, on the road to Sligo.

FOXTOWN, a town of America, in the ſtate of North Carolina: 30 miles S. of Newbern.—Alſo, a town of the ſtate of New York; 24 miles W. of New York.

FOY-LA-GRANDE, SAINTE, a town of France, in the department of the Gironde, and chief place of a canton in the diſtrict of Libourne. The place contains 2,830, and the canton 11,068 inhabitants, on a territory of 145 kiliometres, in 17 communes.

FOYERS, or FYERS, a ſmall river of Invernefsſhire, which takes its riſe among the mountains of Abertarff, running in a northerly direction through the valley of Foyers, and emptying itſelf into Loch Neſs, about the midway between its eaſtern and weſtern extremity, is remarkable for a ſtupendous waterfall. In as deep and romantic a glen as perhaps can be imagined, the Foyers pours its waters between lofty mountains, covered with penſile birch trees, exhibiting their naked, abrupt, and broken fronts, from which huge fragments have been detached. The torrent, confined on the rocky ſides, precipitates itſelf with great velocity into the profound beneath, forming a notable cataract. A little below, a bridge has been thrown acroſs the river, whence a ſight of the fall may be obtained; but the moſt advantageous poſition for viewing the object in all its beauty and grandeur, is at the foot of the rocks beneath. Theſe, with the expanſive arch of the bridge, exhibit a fine pictureſque fore-ground, behind which, at the diſtance of about twenty yards, appears the firſt portion of the fall; the central and largeſt break is a few yards nearer, and the third is over a ledge, almoſt under the arch. From accurate meaſurements taken of this, which is called the Upper Fall, the diſtance from the crown of the arch to the ſurface of the water, after the fall, is 200 feet, and of the fall itſelf, 100. Half a mile lower down, the river ruſhes over another ledge, with a noiſe like thunder, into the abyſs below, forming one unbroken ſheet of ſtream as white as ſnow, foaming and raging over the looſe fragments of rock, which retard its impetuous courſe. From the violent agitation ariſes ſo thick a ſpray, as to completely envelope the ſpectator. The ſcenery and effect of this are beautifully and accurately pourtrayed by a real child of nature, the eccentric Burns.

"Among the heathy hills and ragged woods,
The roaring Fyers pours his maſſy floods;
Till full he daſhes on the rocky mounds,
Where through a ſhapeleſs beach his ſtream reſounds.
As high in air the burſting torrents flow,
As deep recoiling ſurges foam below,
Prone down the rock the whitening ſheet deſcends,
And viewleſs echo's ear, aſtoniſhed lends.
Dim ſeen, through riſing miſts and careleſs ſhowers,
The hoary cavern, wide ſurrounding low'rs.
Still through the gap the ſtruggling river toils,
And ſtill below the horrid cauldron boils."

"This," Dr. Garnet obſerves, from whoſe Tour the account has been extracted, "is undoubtedly one of the higheſt falls in the world; and though the immenſe body of water which falls down the celebrated caſcade of Niagara in North America gives a ſuperiority to that, yet it muſt yield to this in point of height; the former fall being 140 feet, and the latter 212."

FOYLE, a river of Ireland, formed by the confluence of the rivers Derg and Fin near Lifford. It paſſes the city of Derry, and four miles below it expands into Lough Foyle. It is navigable by large veſſels to the quay of Derry, and for lighters which carry twenty tons, to Lifford.

FOYLE-*Lough*, a large bay, or eſtuary, in the north of Ireland, formed by the expanſion of the waters of the river Foyle, and ſeveral ſmaller ſtreams which run into it. It is twelve miles long, and about ſeven broad, and is land-locked on all ſides, the entrance being only half a mile wide. There is a channel in the middle, which is fourteen fathoms at low water, and ten fathoms at the entrance; but on account of its extreme narrowneſs it is difficult to tack up, when the wind blows down the river. Veſſels turning in with a ſouth-weſterly or weſterly wind alſo run ſome hazard of being ſtranded on the beach of Magilligan. This circumſtance is very unfavourable to the trade of Derry.

FOYLING *of Land*, in *Agriculture*, a term ſometimes made uſe of by old farmers for naked or ſummer fallowing; but which at preſent is ſeldom employed.

FOYLING, among *Sportſmen*, a term uſed for the footſteps of a ſtag, on the graſs or leaves.

FOYNA, in *Zoology*, a name given by many to the martin or martes, an animal of the weaſel kind, common with us. See MUSTELA.

FOZ, in *Geography*, a town of Portugal, in the province of Alentejo, at the conflux of the Zatas and Tagus; 24 miles N. E. of Liſbon.

FOZZANO, a town of the iſland of Corſica; four miles N. of Sarſano.

FRACASTORIUS, HIERONIMUS, in *Biography*, a celebrated phyſician of Verona, where he was born in 1483. He ſeemed to be born for ſtudy; for ſuch was the ardour with which he applied, and the rapidity with which he advanced in the ſtudy of the languages, the belles lettres, and the ſciences, that he early attained a high degree of excellence as a poet, a philoſopher, an aſtronomer, and a phyſician. Theſe qualities procured him an univerſal eſteem. The general of the Venetian forces gave him his entire confidence,

fidence, and Fracaſtorius followed him as his phyſician, during many campaigns, and quitted him only at the period of his death, in 1515, when he returned to his native place. It was upon the repreſentations of Fracaſtorius that the fathers, aſſembled at Trent, were induced to transfer the council to Bologna, in order to avoid the contagious epidemic which prevailed at the firſt mentioned place. He maintained a literary correſpondence with moſt of the great men of his age, eſpecially with cardinal Bembo, who was his intimate friend, and to whom he dedicated his elegant poem, entitled "Syphilis," *i. e.* the venereal diſeaſe. This poem was highly admired by Bembo, Sannazarius, and other men of taſte, and was compared with the Georgics of Virgil, for its rich and melodious verſification, its vivid imagery, and its noble ſentiments. Fracaſtorius retired towards the cloſe of his life to a country-houſe near Verona, ſituated at the foot of mount Baldo, where he applied to the ſtudy of aſtrology and coſmography, and died of apoplexy on the 6th of Auguſt, 1553, at the age of 71 years.

All the works of Fracaſtorius have been printed under the title of "Opera omnia Philoſophica et Medica," at Venice, Lyons, &c. His works conſiſt of, 1. "Syphilidis, ſive de Morbo Gallico, Libri tres," firſt publiſhed at Verona in 1530, and afterwards frequently republiſhed, and alſo tranſlated into the Italian and French languages: 2. "Homocentricorum, ſive de Stellis, Liber unus," Venice, 1538, with the following, 3. "Libellus de cauſis dierum criticorum:" 4. "De Sympathia et Antipathia, Liber:" 5. "De Contagionibus, et Contagioſis Morbis, et eorum curatione, Libri tres:" 6. "Naugerius, ſive de Poëtica Dialogus:" 7. "Turrius, ſive de Intellectione Dialogus:" 8. "Fracaſtorius, ſive de Anima Dialogus:" 9. "De Vini Temperatura:" 10. "Joſephi Libri duo:" 11. "Carminum Liber unus:" 12. "Alcon, ſive de cura canum venaticarum."

The town of Verona, which had formerly erected honourable monuments to the memory of Catullus and of Pliny, reſolved to confer the ſame diſtinguiſhing honour on Fracaſtorius; and a ſtatue was acordingly erected to this phyſician, in 1559, "Ex publica Authoritate."

FRACHES, in the *Glaſs Trade*, are flat iron pans, into which the glaſs veſſels already formed are put, when in the tower over the working furnace, and by means of which they are drawn out through the leers, that they may be taken gradually from the fire, and cool by degrees.

FRACTION, in *Arithmetic* and *Algebra*, a part or diviſion of an unit, or integer; or, a number which ſtands to an unit in the relation of a part to its whole.

The word literally imports a broken number.

Fractions are uſually divided into *decimal*, *ſexageſimal*, and *vulgar*.

For *decimal* and *ſexageſimal* fractions, ſee DECIMAL and SEXAGESIMAL.

FRACTIONS, *Vulgar*, called alſo ſimply *fractions*, are always expreſſed by two numbers, the one placed over the other with a line between them.

The lower, called the *denominator* of the fraction, denotes the unit, or whole, that is divided into parts; and the upper, called the *numerator* of the fraction, expreſſes the parts given in the preſent caſe.

Thus, two third parts of a line, or other thing, are written $\frac{2}{3}$: where the denominator 3 ſhews that the whole line is ſuppoſed to be divided into three equal parts; and the numerator 2 indicates or aſſigns two of ſuch parts.

Again, twenty-nine ſixtieths is written $\frac{29}{60}$; where the numerator 29 expreſſes 29 parts of an integer divided into 60; and the denominator 60 gives the denomination to theſe parts, which are called *ſixtieths*.

The real deſign of adding the denominator, is to ſhew what aliquot part the broken number has in common with unity.

In all fractions, as the numerator is to the denominator, ſo is the fraction itſelf to the whole whereof it is a fraction. Thus, ſuppoſing $\frac{3}{4}$ of a pound equal to 15*s.* it is evident, that 3 : 4 :: 15 : 20. Whence it follows, 1°, That there may be infinite fractions of the ſame value, one with another; inaſmuch as there may be infinite numbers found, which ſhall have the ratio of 3 : 4.

Fractions are either *proper* or *improper*.

FRACTION, *Proper*, is that where the numerator is leſs than the denominator; and, conſequently, the fraction leſs than the whole, or integer, as $\frac{25}{46}$.

FRACTION, *Improper*, is where the numerator is either equal to, or bigger than the denominator, and of courſe the fraction equal to, or greater than the whole, or integer, as $\frac{25}{25}$ or $\frac{27}{20}$; or $\frac{90}{22}$.

Fractions, again, are either *ſimple* or *compound*.

FRACTIONS, *Simple*, are ſuch as conſiſt of only one numerator, and one denominator; as $\frac{2}{7}$, or $\frac{14}{350}$, &c.

FRACTIONS, *Compound*, called alſo *fractions of fractions*, are ſuch as conſiſt of ſeveral numerators and denominators; as $\frac{4}{7}$ of $\frac{11}{12}$ of $\frac{5}{6}$ of $\frac{15}{80}$.

Of fractions, thoſe are equal to each other whoſe numerators have the ſame ratio to their denominators.—Thoſe are greater, whoſe numerators have a greater ratio; and thoſe leſs which have leſs: thus $\frac{3}{6} = \frac{4}{8} = \frac{5}{10} = \frac{25}{50} = \frac{1}{2}$. But $\frac{3}{24}$ is greater than $\frac{2}{6}$; and $\frac{4}{6}$ leſs than $\frac{10}{18}$. Hence if both the numerator and denominator of a fraction, as $\frac{4}{6}$, be multiplied or divided by the ſame number 2; the products in the former caſe, $\frac{8}{12}$, and the quotients in the latter $\frac{2}{3}$, will conſtitute fractions equal to the firſt fraction given.

The arithmetic of fractions conſiſts in the *reduction*, *addition*, *ſubtraction*, and *multiplication* of them.

FRACTIONS, *Reduction of.* 1. *To reduce a given whole number into a fraction of any given denominator.*—Multiply the given integer by the given denominator, the product will be the numerator. Thus we ſhall find $3 = \frac{24}{8}$, and $5 = \frac{30}{6}$, and $7 = \frac{28}{4}$, &c.

If no denominator be given, the number is reduced to a fraction, by writing 1 underneath it, as a denominator. Thus $\frac{2}{1}$, $\frac{4}{1}$, $\frac{55}{1}$.

2. *To reduce a given fraction to a fraction equal to it, that ſhall have a given denominator.*—Multiply the numerator by the given denominator, and divide the product by the former denominator, and the quotient ſet over the given denominator is the fraction required. Let it be propoſed to reduce $\frac{3}{4}$ to an equal fraction with the denominator 8; $8 \times 3 \div 4 = 6$, and $\frac{6}{8} = \frac{3}{4}$.

3. *To reduce a given fraction to its loweſt terms, i. e.* to find a fraction equivalent to a given fraction ($\frac{20}{48}$), but expreſſed in leſs numbers; divide both the numerator 20, and denominator 48, by ſome one number, that will divide them both without any remainder, as here by 4. The quotients 5 and 12 make a new fraction $\frac{5}{12}$ equal to $\frac{20}{48}$.

And if the diviſion be performed with the greateſt number that will divide them both, the fraction is reduced to its loweſt terms. See COMMON *Meaſure*.

If it happens that unity is the only common meaſure of the numerator and denominator; then is the fraction incapable of being reduced any lower: and numbers whoſe greateſt common meaſure is unit, are ſaid to be *prime* to each other.

4. To-

4. *To reduce two or more fractions to the ſame denomination*; that is, to find fractions equal to the given ones, and with the ſame denominator. Multiply each numerator, ſeparately taken, into all the denominators but its own, and the products ſhall give the new numerators. Then multiply all the denominators into one another, and the product will be the common denominator. Thus, $\frac{2}{3}$ and $\frac{4}{5}$ are $\frac{10}{15}$, and $\frac{12}{15}$, and $\frac{2}{3}$, $\frac{3}{4}$ and $\frac{4}{5}$ are reſpectively $\frac{40}{60}$, $\frac{45}{60}$, and $\frac{48}{60}$.

5. *To find the value of a fraction, in the known parts of its integer.*—Suppoſe, *e. gr.* it were required to know what is $\frac{9}{16}$ of a pound; multiply the numerator 9 by 20, the number of known parts in a pound, and divide the product by the denominator 16, the quotient gives 11*s.* Then multiply the remainder 4 by 12, the number of known parts in the next inferior denomination; and dividing the product by 16, as before, the quotient is 3*d.* So that $\frac{9}{16}$ of a pound = 11*s.* 3*d.*

6. *To reduce a mixed number, i. e. a number partly integral and partly fractional,* as $4\frac{11}{12}$ *into an improper fraction of the ſame value.*—Multiply the integer 4 by 12, the denominator of the fraction; and to the product 48 add the numerator; the ſum 59 ſet over the former denominator, $\frac{59}{12}$, conſtitutes the fraction.

7. *To reduce an improper fraction into its equivalent mixed number.*—Suppoſe the given fraction $\frac{59}{12}$; divide the numerator by the denominator; the quotient is the integral part, and the remainder ſet over the denominator will be the fractional part. Thus $\frac{59}{12} = 4\frac{11}{12}$.

8. *To reduce a compound fraction into a ſimple one.*—Multiply all the numerators into each other for a new numerator; and all the denominators for a new denominator. Thus, $\frac{1}{2}$ of $\frac{3}{4}$ of $\frac{5}{6}$ reduced will be $\frac{15}{48}$.

9. *To reduce a vulgar fraction to a decimal of the ſame value,* ſee DECIMAL.

FRACTIONS, *Addition of vulgar.*—1. If the given fractions have different denominators, reduce them to the ſame. Then add the numerators together, and under the ſum write the common denominator. Thus, *e. gr.* $\frac{2}{3} + \frac{4}{5} = \frac{10}{15} + \frac{12}{15} = \frac{22}{15} = 1\frac{7}{15}$.

2. If compound fractions are given to be added, they muſt firſt be reduced to ſimple ones; and if the fractions be of different denominations, as $\frac{6}{8}$ of a pound, and $\frac{2}{3}$ of a ſhilling, they muſt firſt be reduced to fractions of the ſame denomination of pounds.

3. *To add mixt numbers.*—The integers are firſt to be added, then the fractional parts: and if the ſum be a proper fraction, only annex it to the ſum of the integers. If it be an improper fraction, reduce it to a mixed number, adding the integral parts thereof to the ſum of the integers, and the fractional part after it. Thus, $5\frac{2}{3} + 4\frac{1}{2} = \frac{17}{3} + \frac{9}{2} = \frac{34+27}{6} = \frac{61}{6} = 10\frac{1}{6}$.

FRACTIONS, *Subtraction of.*—1. If they have the ſame common denominator, ſubtract the leſſer numerator from the greater, and ſet the remainder over the common denominator. Thus, from $\frac{9}{16}$ take $\frac{5}{16}$, and there remains $\frac{4}{16} = \frac{1}{4}$.

2. If they have not a common denominator, they muſt be reduced to fractions of the ſame value, having a common denominator, and then, as in the firſt rule. Thus, $\frac{5}{7} - \frac{2}{5} = \frac{25}{35} - \frac{14}{35} = \frac{11}{35}$.

3. *To ſubtract a whole number from a mixed number, or one mixed number from another.*—Reduce the whole, or mixed numbers, to improper fractions, and then proceed as in the firſt and ſecond rule.

FRACTIONS, *Multiplication of.*—1. If the fractions propoſed be both ſimple, multiply the numerators one by another for a new numerator, and the denominators for a new denominator. Thus $\frac{3}{4}$ into $\frac{5}{8}$ produces $\frac{15}{32}$.

2. If one of them be a mixed, or whole number, it muſt be reduced to an improper fraction; and then proceed as in the laſt rule. Thus, $\frac{2}{8}$ into $5\frac{2}{3}$, gives $\frac{34}{24}$, and $\frac{4}{9}$ into $\frac{10}{1} = \frac{40}{9}$.

In multiplication of fractions, obſerve that the product is leſs in value than either the multiplicand, or multiplicator; becauſe in all multiplications, as unity is to the multiplicator, ſo is the multiplicand to the product: or, as unity is to either factor, ſo is the other factor to the product. But unity is bigger than either factor, if the fractions be proper; and therefore either of them muſt be greater than the product.

Thus, in whole numbers, if 5 be multiplied by 8, it will be as 1 : 5 :: 8 : 40; or 1 : 8 :: 5 : 40. Wherefore in fractions, alſo, as 1 : $\frac{3}{4}$ :: $\frac{5}{8}$: $\frac{15}{32}$; or as 1 : $\frac{5}{8}$ :: $\frac{3}{4}$: $\frac{15}{32}$. But 1 is greater than either $\frac{3}{4}$ or $\frac{5}{8}$: wherefore either of them muſt be bigger than $\frac{15}{32}$.

FRACTIONS, *Diviſion of.*—1. If the fractions propoſed be both ſimple, multiply the denominator of the diviſor by the numerator of the dividend; the product is the numerator of the quotient: then multiply the numerator of the diviſor by the denominator of the dividend, the product is the denominator of the quotient. Thus $\frac{3}{5})\frac{4}{9}(\frac{20}{27}$. Or, invert the diviſor and proceed as in multiplication. 2. If either dividend, diviſor, or both, be whole, or mixed numbers, reduce them to improper fractions; and if they be compound fractions, reduce them to ſimple ones, and proceed as in the firſt rule.

In diviſion of fractions obſerve, that the quotient is always greater than the dividend; becauſe in all diviſion, as the diviſor is to unity, ſo is the dividend to the quotient: as if 3 divide 12, it will be as 3 : 1 :: 12 : 4. Now 3 is greater than 1; wherefore 12 muſt be greater than 4: but in fractions, as $\frac{3}{5}$: 1 :: $\frac{4}{9}$: $\frac{20}{27}$; where $\frac{3}{5}$ is leſs than 1; wherefore $\frac{4}{9}$ muſt be leſs than $\frac{20}{27}$.

FRACTIONS *in ſpecies,* or *algebraic quantities.*—1. *To reduce fractions in ſpecies to their leaſt terms.*—The numerators and denominators are to be divided by the greateſt common diviſor, as in numbers.

Thus the fraction $\frac{aac}{bc}$ is reduced to a more ſimple one $\frac{aa}{b}$ by dividing both aac and bc by c: and $\frac{203}{667}$ is reduced to a more ſimple one $\frac{7}{23}$ by dividing both 203 and 667 by 29; and $\frac{203\,aac}{667\,bc}$ is reduced to $\frac{7aa}{23b}$ by dividing by $29c$. And ſo $\frac{6a^3 - 9acc}{6aa + 3ac}$ becomes $\frac{2a^2 - 3cc}{2a + c}$ by dividing by $3a$. And $\frac{a^3 - aab + abb - b^3}{aa - ab}$ becomes $\frac{aa + bb}{a}$ by dividing by $a - b$. See COMMON *Meaſure.*

2. *To reduce fractions in ſpecies to a common denominator.*—The terms of each are to be multiplied by the denominator of the other.

Thus, having $\frac{a}{b}$ and $\frac{c}{d}$; multiply the terms of one $\frac{a}{b}$ by d, and alſo the terms of the other $\frac{c}{d}$ by b, and they will become $\frac{ad}{bd}$ and $\frac{bc}{bd}$, whereof the common denomi-

nator

nator is $b\,d$. And thus a and $\frac{ab}{c}$ or $\frac{a}{1}$ and $\frac{ab}{c}$, become $\frac{ac}{c}$ and $\frac{ab}{c}$.

But where the denominators have a common divisor, it is sufficient to multiply them alternately by the quotients.

Thus the fractions $\frac{a^3}{bc}$ and $\frac{a^3}{bd}$ are reduced to these $\frac{a^3 d}{bcd}$ and $\frac{a^3 c}{bcd}$ by multiplying alternately by the quotients c and d, arising by the division of the denominators by the common divisor b. The other operations, with respect to numbers, are easily applied to algebraic quantities.

Addition and subtraction of fractions in species.—The process is, in all respects, the same in species as in numbers. E. gr.

Suppose it be required to add the fractions $\frac{a}{b}$ and $\frac{c}{d}$. These, when reduced to the same denomination, will be $\frac{ad}{bd}$ and $\frac{bc}{bd}$; consequently their sum is $\frac{ad+bc}{bd}$.

So, if the fraction $\frac{a}{b}$ were to be subtracted from $\frac{c}{d}$; having reduced them they will be $\frac{ad}{bd}$ and $\frac{bc}{bd}$, as before. Their difference therefore is $\frac{bc-ad}{bd}$.

Multiplication and division of fractions in species.—Here, too, the process is perfectly the same as in vulgar arithmetic. Thus, *e. gr.* suppose the factors, or fractions, to be multiplied, $\frac{a}{b}$ and $\frac{c}{d}$: the product will be $\frac{ac}{bd}$.

Or suppose the fractions required to be divided, $\frac{ac}{bd}$ and $\frac{a}{b}$; the quotient will be $\frac{ac}{bd} \times \frac{b}{a} = \frac{abc}{abd} = \frac{c}{d}$.

Hence as $a = \frac{a}{1}$; the product of a into $\frac{c}{d}$, that is, of an integral quantity into a fraction; $\frac{c}{d} \times \frac{a}{1} = \frac{ac}{d}$. Whence it appears, that the numerator of the fraction is to be multiplied by the integer.

Hence, also, the quotient of $\frac{c}{d}$ by a, that is, of the broken quantity divided by the whole one, $\frac{c}{d} \times \frac{1}{a} = \frac{c}{ad}$.

Beside the common notion of a fraction, there is another necessary to be understood. Thus,

Suppose $\frac{3}{4}$ of 20*s.* or a pound sterling were the fraction: this fraction, instead of three quarters of one pound, may be considered as a fourth part of three pounds; that is, by taking as many of the integers as the numerator expresses (*viz.* 3), and dividing them by 4, the denominator, for then the quotient of the same value will arise; for 4) 60*s.* (15*s.* This shews the reason of that manner of expression used by geometers and algebraists, who read $\frac{a}{b}$, thus, a divided by b.

Fraction, *continued*, is used for a fraction the denominator of which is a whole number with a fraction, the denominator of which is again a whole number and a fraction, and so on, whether this affection be continued *ad infinitum*, or whether the series breaks off after a finite number of terms. Thus,

$$\cfrac{1}{2+\cfrac{1}{3+\cfrac{1}{4+\cfrac{1}{5+,\ \&c.}}}} \qquad \text{or} \qquad \cfrac{1}{2+\cfrac{2}{3+\cfrac{3}{4+\cfrac{4}{5}}}}$$

+, &c. are continued fractions.

If we make use of letters instead of numbers, we shall have general expressions of these fractions, thus,

$$a+\cfrac{1}{b+\cfrac{1}{c+\cfrac{1}{d+\cfrac{1}{e+\cfrac{1}{f+,\ \&c.}}}}}$$

and

$$a+\cfrac{\alpha}{b+\cfrac{\beta}{c+\cfrac{\gamma}{d+\cfrac{\delta}{e+\cfrac{\varepsilon}{f+,\ \&c.}}}}}$$

The reduction of these continued fractions to those of a common form is not difficult by the usual rules of arithmetic and algebra. Thus to give an example which may at the same time shew the use of these continued fractions; suppose the continued fractions,

$$3+\cfrac{1}{7+\cfrac{1}{15+\cfrac{1}{1+\cfrac{1}{292+\cfrac{1}{1+\cfrac{1}{1+,\ \&c.}}}}}}$$

which express the circumference of a circle, when the diameter is one; if we stop at $\frac{1}{7}$, we shall have $3+\frac{1}{7}=\frac{21+1}{7}=\frac{22}{7}$. If we stop at $\frac{1}{15}$, we shall have

$$3+\cfrac{1}{7+\cfrac{1}{15}}=3+\cfrac{1}{\frac{106}{15}}=3+\frac{15}{106}=\frac{318+15}{106}=\frac{333}{106}$$

But if we stop at $\frac{1}{1}$, which is convenient on account of the small fraction $\frac{1}{292}$ added to the last denominator 1, we shall then find, $3+\cfrac{1}{7+\cfrac{1}{15+\cfrac{1}{1}}}=\frac{355}{113}$. The first of the reductions give the proportion of Archimedes, and the last that of Adrian Metius.

But as beginning at the last denominator of the continued fraction makes the computation somewhat tedious, shorter methods have been contrived for the reduction of these fractions, and for a continued approximation to their true value. And Mr. Cotes's method for the reduction of ratios or smaller terms may be here applied. (See Ratio.) For it is to be observed, that when the numerators to the continued fraction are each units, the denominators will be the quotients arising from the continued divisions in Mr. Cotes's method: or in the common, for reducing fractions to a lower denomination, which is in effect the same as Euclid's method for finding the greatest common measure of two magnitudes, lib. x. prop. 3. But a detail of these things would lead us too far, we therefore refer the reader for

for a farther account of these continued fractions to Dr. Wallis's Arithmet. Infinit. prop. 191. Oper. vol. i. p. 469, seq. Huygens, Descript. Automat. Planetar. in Oper. posthum. p. 173, seq. edit. Amstelod. 1728, and particularly to Mr. Euler's Analys. Infinit. vol. i. cap. xviii. p. 295, seq. who has shewn the use and application of this doctine in many instances.

Lord Brouncker seems to have been the first who considered continued fractions, or at least who first applied them to the quadrature of curves. The hint seems useful, but has been pretty much neglected, excepting in approximations to fractions or ratios expressed in great numbers. See the article RATIO. His series for the quadrature of the circle, is

$$\square = 1 \cfrac{1}{2 \cfrac{9}{2 \cfrac{25}{2 \cfrac{49}{2 \cfrac{81}{2, \text{ \&c.}}}}}}$$

in his and Dr. Wallis's notation, which amounts to the same thing as

$$1 + \cfrac{1}{2 + \cfrac{9}{2 + \cfrac{25}{2 +, \text{ \&c.}}}}$$

in the notation of Huygens and Euler.

The symbol $\square$ denotes as before the ratio of the square of the diameter to the area of the circle.

FRACTIONS, *Vanishing*, are those in which the numerator and denominator vanish, or become equal to 0, at the same time. Thus, when any quantity N is expressed by a fraction $\frac{P}{Q}$, if P and Q vanish at the same time, we are not thence to conclude, that N is $= 0$. Suppose $N = \frac{aa - ax}{a - \sqrt{ax}}$; when $x = a$, the numerator and denominator of N vanish together; but if we reduce the value of N to a more simple form, by dividing the numerator and denominator by their common divisor $\sqrt{a} - \sqrt{x}$, we shall find $N = a \times \frac{\sqrt{a} + \sqrt{x}}{a} =$ (when $x = a$) $a \times \frac{2\sqrt{a}}{\sqrt{a}} = 2a$. The idea of such fractions originated, as Montucla has informed us (Hist. Math. vol. ii.) in a severe contest among some French mathematicians, in which Varignon and Rolle were the principal combatants, in reference to the differential calculus, then introduced, which Rolle strenuously opposed. Among other arguments against it, he proposed an example of drawing a tangent to certain curves at the point where the two parts cross each other; and, as by that method, the fractional expression for the subtangent, had both its numerator and denominator equal to 0, at the point proposed, he considered the expression as absurd, and hence objected to the method of solution. The mystery was soon explained, and first of all by Mr. John Bernouilli. Fractions of this kind have been often contemplated by later mathematicians; particularly by Maclaurin (Fluxions, vol. ii. art. 864.) Saunderson (Algebra, vol. ii. art. 469.) Emerson (Algebra, p. 212. apud Works, vol. iv.) and De Moivre (Miscell. Anal. p. 165.) These fractions were the occasion of a sharp controversy between Powell and Waring in their competition for the professorship at Cambridge. Waring maintained that the fraction $\frac{p - p^5}{1 - p}$ became 4, when p was $= 1$. Powell objected to this conclusion as absurd, alleging that when $p = 1$, the fraction $\frac{p - p^5}{1 - p} = \frac{1 - 1}{1 - 1} = \frac{0}{0}$, and lost the professorship. Waring replied that $\frac{p - p^5}{1 - p}$ is $= p + p^2 + p^3 + p^4$ by common division $= 1 + 1 + 1 + 1 = 4$, when p is $= 1$.

Mathematicians have proposed two methods of finding the value of these fractions. The one is by considering the terms of the fraction as two variable quantities, continually decreasing till they both vanish together; or finding the ultimate value of the ratio denoted by the fraction. Thus considered, it appears that, as the terms of the fraction are supposed to decrease till they vanish, or become only equal to their fluxions or increments, the value of the fraction, in that state, will be equal to the fluxion or increment of the numerator divided by that of the denominator, *e.g.* take $\frac{x - x^5}{1 - x}$, when $x = 1$; the fluxion of the numerator is $\dot{x} - 5x^4\dot{x}$, and of the denominator $-\dot{x}$; consequently $\frac{\dot{x} - 5x^4\dot{x}}{-\dot{x}} = \frac{1 - 5x^4}{-1} = \frac{5x^4 - 1}{1} = 5 - 1 = 4$; or the value of the fraction $\frac{x - x^5}{1 - x}$, when $x = 1$. Or thus, because $x = 1$, $\frac{x - x^5}{1 - x}$ will be $= \frac{1 - x^4}{1 - x}$; then the fluxion of the numerator, $-4x^3\dot{x}$, divided by the fluxion of the denominator, $-\dot{x}$, gives $4x^3$ or 4, as before.

The other method is by reducing the given expression to another, in a more simple form, and then substituting the values of the letters. In the former example, $\frac{x - x^5}{1 - x}$ or $\frac{1 - x^4}{1 - x}$, when $x = 1$, divide the numerator by the denominator, and it becomes $1 + x + x^2 + x^3$, which, x being $= 1$, becomes 4 for the value of the fraction, as before. Again, to find the value of $\frac{a\sqrt{ax} - xx}{a - \sqrt{ax}}$, when x is $= a$, in which case both the numerator and denominator become $= 0$; divide the numerator by the denominator, and the quotient $\sqrt{ax} + x + x\sqrt{\frac{x}{a}}$, when, x being $= a$, becomes $a + a + a = 3a$, for the value of the fraction in that state of it. Hutton's Math. Dict. For a farther view of this subject, and particularly of Mr. Woodhouse's objections against vanishing fractions; see *Analytical* FUNCTION.

FRACTION, *Repetend of a decimal.* See REPETEND.

FRACTION, *Logarithm of a.* See LOGARITHM.

FRACTIONS, *summing of infinite.* See CALCULUS, and FLUXIONS.

FRACTION, in *Music*, is one of the terms implying a part or remainder, which Mr. Overend and other writers on the theory or magnitudes of musical intervals have adopted as the general name of three different intervals; indeed nearly all the names of small musical intervals have almost the same meaning in some language, because they all had their origin, or owed their discovery from taking the concords, the only intervals marked strongly by nature, from each other, and these differences or residual intervals again from each other respectively, and thus ultimately, what may be called the elementary intervals have been obtained, as the same are exhibited in a table, plate V. in vol. xxviii. of the Philosophical Magazine. See INTERVAL.

Leffer Fraction of Mr. Overend is an interval, which refults either by taking a minor comma from a prifma, or a femi-comma maxime from a greater refidual; it is the fmalleft interval but one which is yet known, is marked f, and forms the fecond or intermediate term in Mr. Farey's new notation, wherein it has the curious and important property of pointing out, beginning with the femitones, and afcending to what finger-key of the common or Douzeur fcale any interval belongs; thus $358\,\Sigma + 7\,f + 31\,m$, the expreffion for the fifth in this notation, fhews, that it contains feven half-notes or finger-key intervals, and fo of any other interval.

Its ratio is $\frac{450,283,905,890,997,363}{450,395,952,737,049,600}$, which in its component primes is $\frac{3^{37}}{2^{54}\,5^{2}}$; in the new notation it is marked f; its common logarithm is .9999266,5010, whereof the reciprocal is 733,4990; its binary or Euler's logarithm is .000259: it having that decimal relation to the octave 1. It is equal to .013601 major commas, of which it is the $\frac{1}{73.55198}$ part; it is equal 19.03541 minutes, of which it is the $\frac{1}{.05254}$ part; alfo to .149661 fchifmas, of which it is the $\frac{1}{6.5297}$ part.

This interval refults from the fubtraction of numerous intervals, as two fchifmas from a minor refidual, three fchifmas from a medius refidual, four fchifmas from a femi-comma major, five fchifmas from a femi-comma maxime, two medius refiduals from three minor refiduals, five radius refiduals from three greater refiduals, two greater refiduals from five minor refiduals, a femi-comma major from two minor refiduals, three femi-commas major from four medius refiduals, three diafchifmas from a minor femitone; this interval alfo refults when 14 fifths and two minor thirds are taken from 21 minor fourths, but thefe tuneable intervals do not furnifh a practicable mode of tuning this, perhaps, unappreciable interval, becaufe pipes to the compafs of near nine octaves would be wanted for putting the fame in practice.

Medius fraction of Dr. Callcott, is an interval which refults as the difference between a major and a greater refidual; it is marked d in Dr. C's MSS. its ratio is $\frac{50,000,000,000,000,000}{50,031,545,098,999,707}$, which in primes is $\frac{2^{16}\,5^{17}}{3^{35}}$; its value in the new notation is $\Sigma - 3\,f + m$, its common logarithm is .9997260,8915, and reciprocal 2739,1085; its binary or Euler's log. is .000893, and it is .05077 major commas; it is .5,888 times the fchifma; it refults as the difference between a greater fraction and two leffer fractions, and between a minor comma and three medius refiduals, alfo between the fum of a fchifma and minute and three leffer fractions, alfo between the fum of three fchifmas and an apotome, and four hyperoches: if 17 minor thirds be added to three fifths and fifteen minor fourths deducted, therefore this interval refults, but it can fcarcely admit of accurate tuning by this method, on account of the great number of intervals to be tuned.

Greater fraction of Mr. Overend, is an interval that does not refult from the fimple fubtraction of any two of M. Overend's intervals, but is the fum of a medius fraction and two leffer fractions, it is marked F, its ratio is $\frac{4,946,832,462,181,367,513,427,734,375}{4,951,760,157,141,521,099,596,496,496} = \frac{3^{39}\,5^{13}}{2^{92}} = \Sigma - f + m$; its common logarithm is .9995793,8935, and reciprocal 4206,1065, its binary log. = .001411; it is = .07797 major commas, and .858202 fchifmas; it is the difference between a major refidual and five fchifmas, and between an octave and 13 medius femitones; it is the difference between a figma and minute, and a leffer fraction, between a major comma, a minute, and a prifma, between a major refidual and prifma and a hyperoche. When 25 major thirds and 12 minor thirds are taken from 27 fourths, or when 12 fifths and 13 major thirds are taken from 27 fourths, this interval refults, but it can fcarcely admit of correct tuning by thefe methods.

FRACTURE, in *Surgery*, may be defined to be a folution of continuity in a bone, commonly occafioned by external violence; but fometimes by the powerful action of the mufcles, as is almoft always the cafe with regard to the knee-pan. The divifion of a part of a bone with a cutting inftrument, fuch as a fabre, is not ufually confidered as belonging to the clafs of injuries called fractures, although it will certainly fall within the meaning of the words employed in our definition. However, as every perfon of common fenfe knows that there is a difference between breaking things and cutting them, we fhall not offer any apology for the circumftance of our definition being more comprehenfive than it ftrictly ought to be. The imperfection is obvious; but, we believe, not very eafy of removal: all the moft diftinguifhed furgical authors have been obliged to be content with defining a fracture in terms, more or lefs, like thofe which we have ventured to ufe.

General Remarks on Fractures.

Fractures are divided into *fimple*, *compound*, and *comminuted*.

A *fimple fracture* is one, in which the bone or bones are only broken in one place, while the foft parts remain free from any external wound, communicating internally with the fracture.

A *compound fracture* is fo called, when the injury of the bone or bones is conjoined with a wound of the integuments; which wound leads down to the fracture, and is in general occafioned by a protrufion of the broken part of the bone or bones through the fkin.

A *comminuted fracture* is fo named, when the injured bone is broken into feveral pieces.

The fractured bone may be broad, like the fcapula and bones of the pelvis; or, it may be fhort and thick, like the bones of the tarfus and carpus; or, laftly, it may belong to that long fet of bones, which are ufually termed by anatomifts cylindrical.

All the bones of the body are not equally expofed to fractures. Some are more or lefs protected from the effects of external violence by their fituation; others, by their fhape and ftrength. On the other hand, fome are particularly often broken, in confequence of their being fo placed in the body as to be very liable to receive the force of blows, falls, &c.; while other bones are frequently fractured, on account of their having a certain figure and ftructure, which render them weak, and incapable of making any confiderable refiftance.

The broad, flat bones are, for the moft part, fo fituated, and fo circumftanced, with refpect to their ufes, that they are not often fractured. The bones of the cranium, and fome parts of the fcapula, however, are an exception to this obfervation.

The fhort, thick bones are ftill lefs frequently broken. Indeed, their fhape gives them fuch ftrength, and they are generally fo furrounded with elaftic cartilaginous matter, that

that they can hardly be fractured, without the operation of some considerable violence particularly directed against them. Hence, when they are broken, it is almost always in consequence of their being crushed by some heavy weight, or waggon-wheel; or by their being struck by a cannon ball, or bullet. We have one exception to make to this remark: the patella, which ranks as a short thick bone, is very often broken; and this by a cause widely different from that which usually produces the fractures of other bones of a similar form. The patella is occasionally split into two pieces by the powerful action of the muscles concerned in the extension of the leg. Many persons rate the strength of the muscles exceedingly high; but few, unacquainted with the facts which present themselves in surgery, would have any conception that the muscles could rend the firm texture of the bones with which they are connected.

The long cylindrical bones, as Boyer remarks, whether they serve as pillars, as levers, or as arch-ending points of resistance and support, are more frequently fractured than any other description of bones. They may be broken at any part; but the breach of continuity, in the majority of instances, happens at the point of bisection: the fracture being produced, like that of a stick bent beyond its natural extensibility, by a force applied at each extremity. However, the cylindrical bones are also subject to be fractured near their ends, sometimes even at their extreme points, as will be seen when we treat of fractures of the neck, of the thigh-bone, and humerus.

This diversity in the situation of fractures of the long bones makes a material difference with respect to the trouble which is likely to attend the treatment. A fracture near the middle of the bone is the least dangerous; for although the bone is there more slender, and the ends of the fracture more apt to be separated, on account of the surfaces opposed to each other being less extensive, yet the cause of the accident, in this kind of case, has seldom been applied directly to the broken part, and, of course, the adjacent soft parts are generally free from injury. Besides, it is a well-known fact, that much more violence is required to break the bone near one of its ends than in the middle; and, consequently, the first case must commonly be attended with more serious mischief. It is also observed by Boyer, that the treatment of such fractures, as happen about the middle parts of the long cylindrical bones, can be more effectually conducted, because the apparatus, usually employed to keep the ends of the fracture in contact, extends a considerable way both below and above the situation of the injury. In addition to these reasons, why fractures near the heads of the long bones are most troublesome to manage, and most dangerous in their consequences, we have to mention that, in these examples, the neighbouring joint is also apt to inflame, become stiff, and sometimes affected with an incurable anchylosis.

Another circumstance, making a material difference in fractures, is the particular direction which they take, with regard to the axis of the bone, in various cases. In some instances, the breach of continuity runs transversely; in others, obliquely. Certain authors, as Duverney and Heister, have enumerated and admitted, besides *transverse* and *oblique* fractures, also *longitudinal* ones. But M. Louis and Boyer, with every appearance of reason, reject as impossible the longitudinal fracture; unless by that expression are signified the longitudinal splinters of comminuted fractures; which splinters are very apt to attend these injuries, when they are occasioned by gun-shot violence.

A knowledge of the kinds of displacement (if we may use this term) to which the ends of a fracture are liable, and of the manner in which such displacement is produced, is highly important in practice: for the grand object in the treatment consists in preventing the extremities of the fracture from becoming separated, and in rectifying their position, whenever they happen to be displaced

From the vague, inaccurate way in which the general symptoms of fractures are represented by most surgical writers, we should suppose that the ends of all fractures are necessarily displaced, and that these accidents are invariably attended with deformity. Nothing, however, can be further from the truth than this idea. It is true, that the great skill, in the treatment of fractures, consists in keeping the ends of the broken part of the bone in a state of contact; but we are not to infer from this circumstance, that because a bone is broken, and *may* be displaced, that it *must always* be so. Were we to pronounce that there is no fracture, because there appears no deformity, our decision, arising from this criterion, would often display ignorance, and be productive of highly mischievous consequences to the patient. The leg, that part of the body so peculiarly exposed to a variety of accidents, is frequently broken, while the form of the limb remains unchanged. The case which often presents us with a striking illustration of this fact, is when the tibia only is fractured near its upper head, where its diameter is considerable, and consequently the surfaces opposed to each other so extensive, that they are hardly capable of being separated. In this instance, the fibula also operates as a splint, and keeps the extremities of the fracture in their proper situation.

Desirous, as we have been, of correcting the mistaken notion, that deformity is a symptom *always* attendant on fractures, we should be sorry to convey to any one a false idea, that a deviation of the broken part of a bone from its right and natural position, and a consequent alteration in the original shape and appearance of the limb, or part, are not very frequently among the most certain signs by which the nature of the accident may be known. Fractures of the arm and thigh are, almost without exception, attended with deformity, in consequence of the ends of the broken part of the bone not continuing properly applied to each other. It is the same with fractures of the clavicle, as well as with all those in which both bones of the leg and both bones of the fore-arm are concerned.

The derangement to which fractures are subject may happen in the direction of the diameter of the bone; be parallel to, or form an angle with, the axis; or merely affect the circumference.

Boyer observes, that when a bone is fractured transversely, the contiguous surfaces may remain in partial contact, or be totally separated. In a fracture of the tibia, for instance, the inferior portion of the bone may be pushed inward, and totally separated from the superior; or the external part of the former may be placed in contact with the internal of the latter. This incomplete derangement in the direction of the diameter of the bone does not produce any shortening of the limb; but when the transverse derangement is complete, then follows that parallel to the axis of the bone. The derangement in the direction of the diameter happens when the fractured bone is of a considerable size, as the tibia, for instance, when the fracture is transverse, and when the proper means of keeping the parts in their natural situation have been neglected. But, if the fracture be oblique, the surfaces not extensive, and the accident neglected, the derangement in the direction of the axis takes place, and the limb is shortened. Boyer, also, notices that the derangement which attends such fractures

as thofe of the patella, olecranon, &c. might be claffed with the preceding kind; but with this difference, that the fractured ends, inftead of riding over each other, recede one from the other, and are always found feparated by a greater or lefs diftance.

Boyer remarks, that the third fpecies of derangement, or that in which the two portions of a broken bone form an angle one with the other, takes place principally in cafes of comminuted fractures. However, a fimple fracture of the leg might be difplaced in this manner, as may eafily be conceived, by fuppofing the foot placed on an inclined plane, in which cafe, the angle formed would be falient anteriorly, if the heel were lower than the fore part of the foot; pofteriorly, if the contrary.

The fourth fpecies of derangement noticed by Boyer, or that affecting the circumference, is produced by the rotation of the inferior portion of the fractured bone on the fuperior, in fuch a manner, that the part which was anterior becomes internal, or external. We have an inftance of this fpecies of derangement in the fracture of the neck of the thigh bone, when the foot, being ill fupported by the apparatus, and obeying its weight, aided by that of the leg, and by the contraction of the mufcles, turns outward, and carries the lower portion of the broken bone in the fame direction. In this cafe the anterior part of the body of the bone correfponds no longer to that of the neck.

It is explained by the above-mentioned writer, that as the bones are only paffive inftruments of locomotion, they poffefs not, in their own organization, any caufe of the change of fituation which takes place with refpect to the ends of fractures. The caufes are all afcribable to external impulfes, the weight of the limb, and the contraction of mufcles. The caufe of the fracture may be the caufe of the derangement of the fractured portions. Thus, when the thigh is broken by a fall from fome height, the weight of the body on the leg, which refts on the ground, may, befides bending the thigh bone forward, and breaking it, alfo difplace the ends of the fracture.

The celebrated furgeon Ambrofe Paré had his leg broken, and the ends of the fracture difplaced by the fame caufe. The lower portion of the broken bone was quite feparated from the upper, while the latter, driven by the weight of the body, was forced through the integuments, ftocking, &c. into the very ground.

The angular and the rotatory derangement of the fractures may be occafioned by the aukward manner in which the affiftants hold the broken limb, as well as by the weight of the limb itfelf. The action of the mufcles, however, is the moft powerful circumftance by which the generality of fractures are difplaced.

It was that great furgeon, Mr. Pott, who firft fixed the earneft attention of the furgical profeffion on the confiderable fhare which the mufcles had in drawing the ends of fractures out of their proper pofition, and in difplacing them again after they had been fet.

The ears of every reader muft be familiarly acquainted with the phrafe of *fetting* a broken bone; and there is fcarcely a perfon who does not immediately think, that when a limb is fractured, fome force muft be directly ufed, in order to bring the extremities of the fracture into a ftate of even contact with refpect to each other. Many, who call themfelves furgeons, never take the trouble to confider whether the ends of a fracture are difplaced or not. No fooner do they feel a crepitus, and afcertain that a bone is broken, than they take it for granted that the extremities of the fracture muft of courfe be out of their proper place, and that no time fhould be loft before they are forcibly pulled back again.

The old writers on furgery direct us, in cafes in which the thigh or leg is broken, to place the patient in a fupine pofture, and the broken limb in a ftraight one; then, having the upper part of it held firm and fteady, by proper affiftants, we are ordered, by means of bands, ligatures, or even, in fome cafes, by pieces of machinery, to make fuch an extenfion or ftretching of the limb lengthways, as fhall enable the furgeon to place the ends of the broken bone in as even a pofition, with regard to each other, as the nature of the fracture will admit. "This," fays Mr. Pott, "is a fhort defcription of what, in the vulgar phrafe, is called fetting a broken bone; and is moft commonly a painful operation to the patient, a fatiguing one to the operator and his affiftants; and, what is worfe, is, in many inftances, found to be inefficacious; at leaft, not fully to anfwer the intention of the one, or the expectation of the other."

After dwelling on the difficulty, inefficacy, and mifchief attending fuch practice, Mr. Pott remarks, that neither extenfion, nor counter-extenfion, can ever be neceffary, on account of the mere fracture, confidered abftractedly. The broken ends of the bone, or bones, are of themfelves inactive, and, if not acted upon by other parts, they would always remain motionlefs. When any attempt is made to put them in motion, they of themfelves can make no poffible refiftance; nor can any be made on their part, fave an accidental one arifing from the points of the fracture being entangled with each other; and when they have been once, by the hand of the furgeon, placed properly and evenly with regard to each other, they would of themfelves for ever remain fo. What, then, is the reafon why fractured bones always fuffer a greater or lefs degree of difplacement? Why is a broken limb almoft always fhorter than its fellow? What creates the refiftance which we always find in attempting to bring the fractured parts aptly together? Whence does it proceed, that when we have done all that is in our power, (according to this mode of acting,) the ends of the fracture will, in many cafes, become again difplaced, and lamenefs and deformity frequently enfue? In fhort, what are the parts, or powers, which act on the bones, and which, by fo acting on them, produce all thefe confequences?

Thefe parts, fays Mr. Pott, are the mufcles, the only moving powers in the animal body. By the action of thefe on the bones all locomotion is performed, and cannot be performed without them; and, although all bones, when broken, are generally in fome degree difplaced and fhortened, yet it will always be found, that in proportion as the mufcles furrounding, or in connection with a bone, are ftrong, or numerous, or put into action by inadvertence or fpafm, fo will the difplacement of the ends of fuch bone, when fractured, be. The even and fmooth pofition of the fractured ends of a tibia, when the fibula of the fame leg is entire and unhurt, that is, when the mufcles therefore cannot act upon the former; the vifible and immediate deformity, when both the beforementioned bones are broken nearly in the fame place, that is, when the mufcles can act upon and difplace fuch fracture; the great difficulty frequently met with in endeavouring to get a broken os femoris to be even tolerably fmooth, and to prevent fuch broken limb from being much fhorter than the other, are, among others which might be produced, fuch ftrong and irrefragable proofs as need no comment.

A very remarkable cafe is cited in "Les Oeuvres Chirurgicales de Default par Bichat," to fhew that the derangement of

of broken thighs is occasioned by the action of the muscles. The patient was a carpenter, who had fallen from a scaffold, and broken his thigh. On the day after the accident the limb was as long as the other; but the lower extremities were both affected with a complete paralysis, attended with a retention of urine. However, no sooner had the muscles recovered their power of action, in consequence of moxa being applied, than the shortening of the limb made its appearance.

When we come to the consideration of particular fractures we shall have occasion to point out what muscles have the most considerable effect in separating the ends of the broken bone from each other, and what plans may be adopted for the prevention of such displacement.

Writers have distinguished the causes of fractures into two kinds, namely, predisposing and remote.

Among the predisposing are usually enumerated the situation and function of the bones, the age of the patient, and certain diseases under which he may be labouring.

Thus, as Boyer has observed, superficial bones are more easily fractured than such as are covered with a considerable quantity of flesh. Thus, the radius which supports the hand, and serves as a kind of handle for it, is more apt to be broken than the ulna. The clavicle also is very frequently fractured, in consequence of its office, which is to keep the shoulder in its proper position, and bear upon its arched extremity all the motions of the arm.

The bones of old subjects are exceedingly brittle, on account of the great quantity of phosphate of lime contained in their texture, in proportion to the animal matter; or, in other words, by reason of the large proportion of the inorganized to the organized part of their structure. On the contrary, the bones of children and young persons contain a large quantity of fibrous, elastic, animal matter, and a smaller proportion of earth, so that they are very flexible and yielding, by which means they often elude the effects of external violence, and remain unbroken.

Louis and Saviard have related examples, in which female patients labouring under old ulcerated cancers, have had their bones affected with such brittleness, that merely moving in bed would break some of them. Here the first indication is to correct, if possible, the state of the system which is the cause of the fragility of the bones.

Some authors have been absurd enough to impute the frequency of fractures in cold weather to the bones being then more brittle, as if the great number of falls which happen on icy slippery places in the winter season were not a more rational explanation of the fact. With regard to the symptoms of fractures, several are only of an equivocal nature, as, for instance, the pain, and the difficulty or impossibility of moving the limb. The same observation is also applicable to the shortening of the limb, and the alteration in its shape, which are sometimes the consequence of fractures. However, no certain inference can be drawn from these signs, unless it be first ascertained that the deformity is not natural, and does not proceed from a dislocation. It is true, the limb may occasionally form such an angle at the broken part, and the ends of the bones may be so prominent, that the accident cannot fail to be apparent to the most careless and least discerning examiner. However, this clearness in regard to the nature of the case is only occasional; and many fractures are attended with a kind of deformity which involves things in more doubt.

The reader is not to imbibe the supposition that all fractures are attended with deformity; nor must he think, on the other hand, that because there is no change in the shape and external appearance of the limb, or part, there is certainly no fracture.

The most certain symptom of a fracture is what is termed a crepitus, by which is meant, that grating sensation and noise which the fingers and ears of the surgeon have communicated to them when the ends of the fracture rub against each other.

Surgeons are generally too solicitous about feeling the crepitus, whenever they suspect a fracture. It is undoubtedly the least ambiguous of the signs by which the accident may be known; but let it be remembered, that rubbing the ends of a broken bone against each other, and against the surrounding flesh, puts the patient to most excruciating torture, and aggravates all the inflammatory symptoms which must ensue. Hence, whenever the nature of the case is sufficiently evident from the bent appearance of the limb, projection of the ends of the bone, &c. it does not become a humane practitioner to move and disturb the fracture for the purpose of feeling the crepitus. Such conduct would only be gratifying a most useless kind of curiosity at the expence of much suffering to the poor patient.

In some instances of fractures no crepitus can be discovered; nor is there any other symptom present by which the existence of the accidents can be detected with absolute certainty. Several causes may be the occasion of this obscurity. In particular cases, the injured bone is surrounded by so considerable a quantity of flesh, that it is next to impossible to feel the breach of continuity, or perceive a crepitus. In an example of this kind, the accident may continue for ever undiscovered, if the ends of the fracture are not materially separated, and, consequently, there is no deformity. Fractures of the neck of the thigh-bone are often circumstanced in the foregoing manner. A fracture of the tibia, fibula, or ulna, alone, is frequently very difficult to discover, because the other bone, which remains uninjured, prevents any change in the shape of the limb, and keeps the ends of the fracture from moving with sufficient freedom to communicate the distinct sensation of a crepitus.

We shall conclude these observations, relative to the diagnosis of fractures, with earnestly exhorting surgeons, in all cases of doubt, to act in the same way as they would do were they certain of there being a fracture. The application of a bandage, splints, &c. can never do harm, and may be the means of preserving the patient from irremediable deformity and lameness. Every experienced practitioner knows how difficult it frequently is to feel a distinct crepitus when a single rib is broken; but, because he cannot actually perceive the ends of the bone grate, he does not omit to apply a tight bandage round the thorax, provided the kind of pain which the patient complains of in respiration, and the nature of the blow, justify a suspicion that the accident has happened.

On the subject of the prognosis we have to remark, that, in general, fractures of bones, which are acted upon by numerous powerful muscles, are more troublesome to cure than other fractures which befall bones differently circumstanced.

Fractures of the arm are generally attended with less danger than those of the leg.

Fractures which take place near the middle of a long bone are usually not so serious in their consequences as fractures which happen in the vicinity of a joint. In the first cases, the force has commonly operated at some distance from the breach in the bone, and the soft parts immediately round the fracture have consequently not suffered any considerable degree of contusion. But, when the head of a long bone is broken, the force has in general been applied

plied directly to the fractured part, fo that the fkin and mufcles are more injured than in the preceding kind of cafe; and, as the neighbouring joint is liable to inflame, anchylofis s apt to enfue. Another reafon why a fracture of the head of a long bone is troublefome to cure, is, that the fplints cannot effectually keep the fhort fragment fteady.

Oblique fractures of the limbs are far more dangerous than tranfverfe ones, becaufe the two floping furfaces flip over each other, and make no refiftance to the mufcles, which have a continual tendency to draw upward the lower part of the broken bone.

Compound fractures are infinitely more hazardous than fimple ones, and often terminate in the lofs of the limb, or even of the patient's life. The practitioner is frequently called upon to exercife the niceft judgment and difcrimination in determining whether an attempt fhould be made to fave the limb in thefe cafes, or amputation be at once performed.

The peril attendant on all fractures may be greatly increafed by the foft parts being confiderably contufed or lacerated, by fome large artery being wounded, &c.

Fractures of the lower extremities, *cæteris paribus*, are accounted more dangerous and difficult of cure than thofe of the arm and fore-arm.

It feems hardly neceffary to obferve, that the patient's age, and the ftate of his health, make a material difference in the degree of danger attendant on a fracture. A debilitated old man cannot be expected to get well fo often and expeditioufly as a younger perfon, poffeffing a fine conftitution. Childen's fractures are united with aftonifhing quicknefs.

The fcurvy is faid to hinder broken bones from uniting, by preventing the formation of callus. Authors have alfo afferted, that pregnancy has the fame effect; but Boyer does not believe this to be true, and our own experience enables us to corroborate what this laft author has ftated; for we attended, a few years ago, a young woman who broke both bones of her leg, when five or fix months advanced in pregnancy, but who, notwithftanding her ftate, recovered in lefs than two months.

There are certain perfons, in whom bones which happen to be fractured, remain difunited throughout life; nor can any very good explanation of the reafon of this circumftance be afforded. In the fituation of the fracture a fupernumerary joint is formed, and the limb continues for ever afterwards flexible in a fituation where it ought not to be fo. On this fubject we fhall have occafion to fay a few words again.

The general doctrine relative to the treatment of fractures has been arranged under the following heads:

Extenfion.
Counter-extenfion.
Coaptation, or Setting.
Application of Medicaments.
Deligation, or Bandage.
Pofition.
Prevention, or Relief of Accidents.

In every cafe of fracture, where the ends of the broken part of the bone are difplaced, it is obvioufly the firft indication to put them into an even and natural pofition with regard to each other. It is only with this view that extenfion and counter-extenfion are ever requifite.

Extenfion is the force exerted on the lower portion of the broken bone, in order to bring down its upper end into a ftate of coaptation with the lower end of the upper piece of the fame bone. Counter-extenfion is a refifting force, employed to prevent the whole limb, or even the whole body, from obeying the force of extenfion.

The reader is already apprized of the various kinds of derangement to which fractures are fubject, and alfo of the principal fhare which the mufcles have in difplacing the ends of broken bones, refifting their coaptation, and putting them out of their proper pofition again, after they have been fet. Such information muft at once lead us to perceive that both in the fetting, and throughout the whole of the treatment of fractures in general, the great furgical aim is to diminifh as much as poffible the power of fuch mufcles as have moft influence in throwing the ends of the broken bone out of their right pofition.

Mr. Pott undertook to confider what it was which gave to a mufcle, or to the principal mufcles of a limb, the greateft power of refifting any force applied to them *ab externo*, in order to draw them out into greater length; for, fays he, whatever that is, the fame thing will be found to be the caufe of the different degrees of refiftance in fetting a fracture.

This eminent furgeon contends, that putting the mufcles into a ftate of tenfion, or into a ftate approaching nearly to that of tenfion, almoft neceffarily gives them an opportunity of exerting their greateft power, either of action or refiftance. On the other hand, he enquires what is the ftate or pofition of a mufcle, which is moft likely to prevent it from acting, and diminifh, as much as poffible, its power of refiftance? Or, what is that pofition of a limb which, in the cafe of a broken bone, will moft incapacitate the mufcles from acting on and difplacing it; and which will, in the greateft degree, remove that refiftance which they have it in their power to make to the attempts for the reduction of fuch fracture? Mr. Pott believed, that putting a limb into a pofition which relaxes the whole fet of mufcles belonging to the broken bone, muft beft anfwer fuch purpofe, and, confequently, he urgently recommended furgeons to put the limb into this pofture at the time of making the extenfion and reducing the fracture. In cafes of broken thighs and legs, the pofition which he advifed was that in which the limb lies on its outfide, with the knee half bent, and the thigh in a fimilar ftate, as will be hereafter defcribed.

Practitioners have undoubtedly received from the able writings of Pott a great deal of valuable information; and enforced, as all his precepts are, in an authoritative, animated ftyle, they make confiderable impreffion, and are, perhaps, too liable to be received as incontrovertible truths, needing no further inveftigation. When we are told that relaxing a mufcle, or bringing its origin and infertion nearer together, diminifhes its power, we fee the truth of the obfervation, becaufe a mufcle acts by fhortening itfelf; and it obvioufly can only fhorten itfelf to a certain degree. But when we are advifed to put a limb into fuch a pofition as fhall relax the whole fet of mufcles, which have the power of moving the broken bone, we are puzzled to conceive what pofture can be meant; for it is evident, that when we bend a joint, we make the extenfor mufcles tenfe; and, that when we ftraighten it, we put the flexors on the ftretch. In the precife pofitions which Mr. Pott recommends for fractured thighs and legs, fo far is the whole fet of mufcles from being relaxed, that many of them may be faid to be very much on the ftretch; and, in the cafe of a broken arm, with the elbow bent, are not the triceps and anconæus in a ftate of tenfion, in confequence of the fame pofture, by which the biceps and brachialis internus are relaxed?

By thefe obfervations we are far from intending to infinuate, that any of the poftures, to which allufion has been made, are not fuch as ought to be preferred. Our prefent

design is only to shew, that to entertain an idea that every muscle, belonging to a bone, may be relaxed by bending a joint, is absurd in the extreme.

It is by no means true that, in every fracture, extension and counter-extension are requisite: in fractures of the patella and olecranon they would absolutely be improper. In these examples, it is only necessary to extend the leg and fore-arm, so as to relax the muscles which draw up the upper piece of the bone, and then it may easily be pushed into contact with the lower portion.

When the derangement is in the direction of the diameter of the bone, a very little extension is enough; as here the only object of it is to diminish the friction of the surfaces of the fracture, which are to be moved in opposite ways.

When the two portions of a broken bone form an angle with each other, no extension and counter-extension are necessary; and the surgeon has only to put the limb on a horizontal plane, in order to bring the bone into its right position.

It is equally evident, that the rotatory derangement of a fracture requires no such proceedings, since the bone may be set right by merely turning the lower fragment in a direction contrary to that in which the fracture has been displaced.

Extension and counter-extension, then, can only be of real use when the derangement happens in the direction of the axis of a bone.

It is not an uncommon supposition, that a fractured limb may be in such a state as not to admit of the extension necessary for its being set; and when much swelling, inflammation, and pain, affect the member, some practitioners confine their attention at first entirely to these symptoms. Under this method of treatment, the space of time which is lost in relieving these complaints is sometimes considerable; so considerable that, as Mr. Pott observes, an even coaptation becomes afterwards impracticable: and then the inflammatory symptoms, which nine times in ten are capable of immediate relief, are urged as an excuse for unnecessary lameness and deformity.

The fact is, no fracture which is displaced should ever be allowed to remain so: the most powerful of those muscles which produce the derangement ought, if possible, to be relaxed, by placing the limb in a judicious posture; and in such posture the bones should be set, without one moment's time being lost. The coaptation of the fracture is, in fact, the most effectual means of diminishing the tension, swelling, and pain in the limb; as any one may conceive, who has a just notion of what mischief the rough, sharp extremities of an unset fracture must do to the surrounding soft parts. The foregoing symptoms, which would subside almost of themselves after the fracture has been set, might, under the use of poultices and fomentations, consume so much time, that, on an attempt being afterwards made to set the fracture, the bone would be found already united in its deformed position, and all change for the better now impracticable.

The general custom of surgeons in this country is to apply the power of extension to the lower portion of the broken bone, and that of counter-extension to the upper piece; and when the strongest muscles, concerned in displacing the fracture, have been relaxed, the hands of the surgeon, sometimes aided by those of an assistant, usually suffice for making such extension and counter-extension as is necessary for putting the ends of the fracture into as even a state of coaptation as the nature of the case will allow.

In France, the most distinguished surgeons, like Desault and Boyer, make the requisite degree of extension and counter-extension in a manner very different from that which is adopted by English practitioners. These foreign surgeons object to our method, that it is often difficult to take hold of the upper and lower portions of a fractured bone, and sometimes quite impossible, as when the neck of the thigh-bone is broken; and that applying the force immediately upon the muscles which surround the fracture irritates them, and makes them enter into violent and spasmodic contractions. Hence, Desault and Boyer advise the extension to be made on the lower part of the limb, or on the bone which articulates with the lower piece of the fracture, while the counter-extension is to be made on the bone which articulates with the upper piece. For example, in the case of a broken leg, they recommend the extending power to act on the foot, and the counter-extending on the thigh; and in the instance of a fractured thigh, they advise such powers to operate on the leg and pelvis.

In regard to the choice of these methods, we have to remark, that as, in this country, most fractured limbs are placed in the bent position, in order to be set and united, the French mode of making extension and counter-extension is quite inadmissible, because the direction of the bones, above and below the fractured one, is, in such position, quite different from that of the latter.

We shall now suppose coaptation performed, and the ends of the fracture placed together in as smooth a manner as possible. The next indication is to keep them quietly in this position, until they have acquired a firm union to each other. This object is generally much more difficult of accomplishment than setting the bone; for the muscles have a continual tendency to draw the ends of the fracture asunder again: and when such muscles are strong and numerous, the fracture oblique, and the patient very much troubled with involuntary spasms, all the care and skill of the most consummate surgeon will sometimes hardly avail in making the extremities of the fracture grow together, without some degree of deformity.

For the purpose of preventing the ends of the fracture from changing their position, it is not enough to put the limb in such posture as tends to relax the muscles, which have the greatest power in disturbing the coaptation; for, in general, no posture can possibly be chosen which will incapacitate every muscle connected with the broken bone. Besides, whatever position we choose, the weight of the limb will gradually occasion a material alteration in it, unless care be taken to lay the fracture on a bed which is not liable to yield much. Indeed, it is greatly to be lamented that, in all our public hospitals, there should be no beds expressly allotted to patients with broken limbs. As Boyer, Desault, and others, have insisted on, the horizontal support, given to a fractured leg or thigh, ought to be capable of making considerable resistance, without being hard enough, however, to create any uneasiness or pain. Hence, a mattress of hair seems preferable to one made of wool, or feathers; which substances are too soft, and consequently yield to the weight of the limb. The good effects of a favourable posture are to be assisted with the mechanical support derived from an apparatus, which usually consists of a piece of plaster, some kind of bandage, pads and compresses, and long, flat, broad pieces of wood or tin, called splints.

With regard to the *application of medicaments*, in cases of simple fractures, a piece of plaster, composed of the soap-cerate, seems now to have obtained the universal approbation of all the best surgeons of the present day. It was first brought into general use by that distinguished surgeon Mr. Pott, who recommended it, in his remarks on fractures, in preference to adhesive plasters, which formerly were sometimes applied. "The adhesive plaster," says this author,

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"must for ever be wrong upon any rational principle. The intention, in applying any kind of external medicine to a broken limb, is, or ought to be, to repress inflammation; to disperse extravasated blood; to keep the skin lax, moist, and perspirable; and, at the same time, to afford some, though a very small, degree of restraint or confinement to the fracture, but not to bind or press; and it should also be calculated, as much as possible, to prevent itching, an herpetic eruption, or an erysipelatous efflorescence. Adhesive plasters of all kinds, let the composition of them be what it may, are, from this one quality, the least likely to contribute to any of the good ends proposed; and the most likely to be the cause of the contrary inconveniences, which ought most carefully to be avoided. They obstruct perspiration, they heat the skin, they produce itching, eruption, and inflammation; and if the fracture be quite surrounded by them, and the limb be from any cause ever so little inclined to swell, they make a tight, painful, and pernicious stricture, much greater even than a roller, and less likely to relax." Mr. Pott next proceeds to recommend the soap-cerate plaster, which, he observes, lies very easy, repels inflammation, is not adherent, comes off clean, and very seldom, if ever, irritates or causes either herpes or erysipelas.

The next practical maxim which this writer urged was, that whatever application be made to the fracture, it should be put on in such a manner as will allow it to be renewed and shifted, as often as necessary, without moving the limb in the least. He insisted, that when once a broken thigh or leg has been put to rights, and has been properly deposited in an eligible situation, it ought never to be lifted up, or moved from it again, without necessity, until the fracture is perfectly united; and such necessity will not very often occur. The frequent motion of a fractured limb cannot possibly contribute to the patient's ease; nor will any one contend, that when a broken limb has been once deposited in the best position possible, that such position can be mended, merely by taking such limb up and laying it down again.

These facts led Mr. Pott to condemn the employment of any kind of apparatus, which could not be taken off without disturbing the fracture; and hence he reprobated the plan of applying a common roller to broken legs, which sort of bandage stood in need of being removed and put on afresh every three or four days; which could never be done, without lifting up the limb from the splint and pad on which it was deposited.

Deligation, as it was termed, is another part of the treatment of fractures in general. The ancients, and the majority of practitioners up to the time of Pott, used to apply what is commonly called a roller, which was of different lengths, or sometimes consisted of one, two, or more pieces. Hippocrates was in the habit of employing three; Celsus, six; and later surgeons, one. Mr. Pott remarks, that, by such kind of bandage, three intentions were formerly aimed at; *viz.* to confine the fracture, to repress or prevent a flux of humours, and to regulate the callus. However, though this author acknowledges that some sort of bandage is necessary in every simple fracture, as well for preserving some degree of steadiness in the limb as for the retention of the applications, yet neither of these ends can be answered merely, or even principally, by bandage of any kind whatever. Hence Mr. Pott contends, that if every sort of deligation cannot be a principal, but only an accessorial kind of assistance, very little to be depended upon, such kind of bandage as is most difficult to be applied with justness and exactitude, such as is soonest relaxed and out of order, such as stands most frequently in need of renewal, and, in such renewal, is most likely to give pain and trouble, must be more improper and less eligible than one which is more easily applied, less liable to be out of order, and which can be adjusted without moving the limb.

The *degree of support and steadiness*, communicated to a fractured limb by a linen roller, must obviously be very trivial. The old idea, also, of *preventing a flux of humours*, by means of the bandage, was entirely erroneous. If, says Mr. Pott, by the points and edges of the broken bone the muscles and other soft parts be unavoidably wounded and torn; or, if the same kind of mischief be incurred by the inadvertence or indiscretion of the patient, or of those who assisted in getting him home, or from the violence used in extending the limb and setting the fracture, inflammation must be excited, and pain and tumefaction will be the consequence; and these will continue for some time in every fracture; but their duration will be longer or shorter, in different cases, and under different circumstances. Evacuation, rest, and a favourable position of the limb, will, and do in general, remove all these complaints. Bandages, however, can do nothing more, in bringing about this benefit, than keep the applications in their proper place: on the contrary, if the bandage be a roller, it must, by the frequent necessity of its being adjusted, and the frequent motion of the limb, in some degree counteract the proper intention of cure.

The third purpose for which the roller was formerly applied was the *regulation and restraint of the callus*. The old surgeons used to look upon callus as a particular juice always ready to ooze from the ends of fractures, for the purpose, as it were, of soldering them together; but it was imagined that, unless such callus was restrained by art, it would always flow in such quantity as to create trouble and deformity. This gelatinous kind of fluid is undoubtedly the medium by which fractures are united; but, Mr. Pott very ably explains, that art is by no means capable of managing it. He admits, that the callus does oftentimes create tumefaction and deformity, or even lameness; but, he contends, that the fault, in these cases, does not lie in the mere redundance of such juice: it is derived from the nature of the fracture, from the inequality of it when set, and from the inapt position of the broken ends, with regard to each other; nor is surgery, nor the surgeon, any otherwise blameable in this case than as it was, or was not, originally in their power to have placed them better. The inequality of the fracture occasions the seeming redundance of callus, and the swelling in the place of the union. Mr. Pott observes, that when a bone has been broken transversely, or nearly so, and its inequalities are therefore neither many nor great; that when such broken parts have been properly set, and proper methods used to keep them constantly and steadily in such state, the divided parts unite by the intervention of a gelatinous effusion, which is gradually converted into new bone. The place where the union has taken place is very little perceptible, and causes no deformity nor inconvenience. But, when a bone has been broken very obliquely, or very unequally; when the parts of a fracture are so circumstanced as not to admit of exact coaptation; when such exact coaptation, as the fracture perhaps would have admitted, has not been judiciously made; when from unmanageableness, inadvertence, or spasm, the proper position of the limb has not been attended to, or preserved: in all such cases, there must be considerable inequality of surface; there must be risings on one side, and depressions on another; and the callus cannot unite the parts in the same time, or in the same way, as when the fracture is transverse, and evenly set. The deformity will be proportioned to the greater or lesser exactitude

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tude with which the fracture is put in a state of coaptation; the most disfigurement happening when the fracture is not set at all, that is, when the broken ends of the bone unite by touching each other's sides.

Mr. Pott concludes this part of the subject with remarking, that this doctrine of callus, considered as a particular kind of juice, and as being liable to great redundance, if not prevented by art, has not only misled many people, but has often been made use of as a cover to ignorance and neglect. When lameness and deformity have been the consequences of one or both these causes, more than of the nature and circircumstances of a fracture, the callus has been found ready at hand to take the blame; and the ideal exuberance of this cement has often been urged as an excuse for real want of knowledge, or for gross neglect.

Instead of a common roller, all surgeons now employ, for simple fractures of the leg and thigh, what is usually termed the eighteen-tailed bandage. In general, the pieces which are to surround the limb are so arranged as to form a right angle with the piece which runs along under the member. However, Mr. Pott advises us to tack on the cross-pieces, so as to make an acute angle; by which means they will fold over each other in an oblique direction, fit more neatly and more securely, and have more connection with, and more dependence on, each other. The eighteen-tailed bandage was used for compound fractures some time before its application was extended to simple ones. In the first instances, surgeons were struck with the advantage of not being obliged to lift up and disturb the limb every time it was dressed, and every time the bandage became slack. As Mr. Pott remarks, the pain attending motion in a compound fracture, and the circumstances of the wound, are certainly very good reasons for dressing such wound with a bandage, which does not render motion necessary: but, he asks, what can make it right to move a limb, in the case of simple fracture? When a broken bone has been well set, and the limb well placed, no good can arise from moving it; but considerable mischief may be occasioned by the disturbance. Perfect quietude is as necessary towards the union of a bone in a simple as in a compound fracture. In the latter case, there is a wound which requires to be dressed, and motion may excite rather more pain than in the former; but, notwithstanding this, motion is also highly prejudicial in the case of a simple fracture. Mr. Pott has explained, that every benefit, which can be supposed to be obtained by the common roller, is equally attainable from the use of the eighteen-tailed bandage, with one additional, and, to the patient, most invaluable advantage, *viz.* that of never finding it necessary to have his leg or thigh, once during the treatment, moved from the pad on which it has been laid.

The reader must not infer from the foregoing observations, that a common roller is never eligible for simple fractures on the contrary, it is always preferred for fractures of the arm, and generally also for those of the fore-arm.

The next parts of the apparatus for fractures are the splints, which are usually made of wood, tin, or pasteboard, and are applied length-ways on the broken limb. In fractures of the arm and thigh surgeons generally make use of four; in those of the leg and fore-arm, two. As the design of splints is to communicate to the limb, for a certain time, steadiness and inflexibility, it is obvious that they should always be formed of such materials as are sufficiently firm and unyielding.

The old surgeons used to err considerably in the application of splints, only employing such as were so short, that they merely extended a little way above and below the fracture, without reaching to either of the neighbouring joints. In this manner of application, and of this size, as Mr. Pott has remarked, splints are in fact neither more nor less than compresses, and compresses made of very bad materials. All the good that ever is or that can be done by them, when of such length, and so applied, might certainly be done in a better manner by a more proper kind of compress; and every disadvantage which a hard resisting compress, injudiciously applied, is capable of producing, is probable to result from them thus used.

The same author explains, that the true and proper use of splints is to preserve steadiness in the whole limb, without compressing the fracture at all. By the first effect, they become very assistant to the curative intention; by the second, they are very capable of causing pain and other inconveniences, at the same time that they cannot, in the nature of things, contribute to the steadiness of the limb. In the case of a broken leg, the splints should be long enough to reach above the knee, and below the ankle; and, in all instances, they should be hindered from making painful pressure on any part of the limb, by lining them with pads, well stuffed with tow, wool, or any soft substance.

When the thigh-bone is fractured, if the limb is laid in the straight position, one splint should reach from the hip to the outer ankle, and another from the groin to the inner ankle.

The proper *position* in which fractured limbs should remain, during the cure, would be our next subject for consideration, were we not induced to defer what we have to say on this point till we treat of particular fractures.

With respect to the *prevention and relief of accidents*, the chief symptoms which the surgeon has to counteract are inflammation and swelling of the limb. In order to avert these complaints, the most effectual plan, as the reader must already understand, is, after setting the fracture, to keep it completely motionless, until it has become firmly united. That all disturbance of the rough, sharp extremities of a recently broken bone must irritate and do great mischief to the surrounding soft parts, is a truth so manifest as to need no comment.

When the surgeon, on his first arriving in the patient's chamber, finds the limb not merely fractured, but considerably bruised; or when, after a day or two, great swelling and inflammation come on; the most proper practice is to wet the bandage with the saturnine lotion, and place folded linen, wet with the same application, under the upper pad and splint. It will not be necessary to take off the splint every time more of the lotion is to be applied: it will be quite enough to squeeze some of the fluid out of a sponge into the interspace between the splints; by which means, the bandage and linen will be kept constantly wet, and an incessant evaporation from the limb maintained. When a good deal of ecchymosis prevails, a lotion composed of vinegar, spirit of wine, and muriate of ammonia, is the most efficacious in promoting the absorption of the extravasated blood. We need hardly observe, that when it is deemed proper to apply a lotion, the emplastrum saponis becomes superfluous.

Patients with fractured limbs should be kept on a low regimen, for the first few days, unless extreme old age or great debility should forbid; but, after the hazard of inflammation is over, a nourishing diet is to be recommended, as a certain vigour in the circulation, and strength of constitution, greatly expedite the process by which broken bones unite.

In some patients who have fractured limbs, the swelling and inflammatory symptoms are so considerable, that prudence dictates the propriety of taking away blood. The

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neceffity of fuch practice particularly occurs when the bone has been broken with great violence, and the patient is ftrong, robuft, and of a plethoric habit.

Another invariable indication, throughout the treatment of all fractures, is to keep the bowels in a regular ftate; for coftivenefs is very apt to refult from the degree of confinement to which the patient is unavoidably fubjected.

The furgeons fhould never forget to prefcribe opium, in all cafes of fractures attended with fevere pain, violent fpafms, lofs of fleep, &c.

When an artery of a certain magnitude happens to be wounded by the fharp point of a fractured bone, and a confiderable quantity of blood is effufed in the cellular membrane, it may be indifpenfably neceffary to cut down to the veffel, and tie it with two ligatures, one above, the other below the laceration in it. J. L. Petit mentions an inftance, in which an aneurifm was produced by a wound of the anterior tibial artery, in the cafe of a broken leg.

With regard to the procefs by which fractures unite, it is not very diffimilar from that by which wounds in foft parts are healed. The veffels of the broken furfaces of the bone, very foon after the accident, pour out coagulated lymph. Into this lymph either the neighbouring veffels fhoot, or in it new ones are in fome inexplicable way or another generated. The veffels, in a certain time, acquire the power of fecreting lime, and thus convert the coagulating lymph into new bone, or callus, which, from being at firft as flexible as cartilage, gradually affumes all the firmnefs, inflexibility, and other qualities of original bone. Some perfons, when they fee a broken limb raifed from the fplints, at the end of about a fortnight, are apprehenfive left the bones fhould fnap again; but, though they may be obferved to bend, they do not break, which laft evil is generally prevented by the great flexibility of the callus in the early ftate of its formation.

Surgeons occafionally meet with patients in whom there feems to be no power of forming callus, fo that fractures cannot unite. The caufe of this peculiarity, as far as we have been able to learn, feems to be involved in obfcurity, and probably will never be well underftood. It is not one kind of conftitution in which fome impediment to the generation of callus prevails; for we ourfelves have feen fractures remain difunited in perfons of very different temperaments, notwithftanding the greateft care was taken, and the utmoft fkill exerted to procure an union. We have feen an inftance in which a ftrong, healthy, mufcular young man broke the os brachii, fomewhere about the infertion of the deltoid mufcle; but, notwithftanding every poffible attention, fuch fracture never united, and was at length converted into a kind of joint. This patient fubmitted to have the ends of the fracture cut down to, and fairly fawn off, but, though the limb was a fecond time carefully kept in fplints and a fling, no union enfued. The only remarkable particularity about this man was a great indifference to pain.

We have alfo met with a very hypochondriacal patient, a man about two or three and thirty years old, in whom a fracture of the tibia and fibula did not unite till after a very confiderable fpace of time, not lefs than four months.

There was likewife, at the latter end of the year 1808, in St. Bartholomew's hofpital, a woman, whofe fractured os brachii remained difunited for feveral months, though particular attention was paid to her. It happened, that while fhe was under fir James Earle fhe was feized with fome illnefs, of which fhe died. The arm was now carefully examined, in order to fee whether any caufe could be difcovered for the want of union in the fracture; and, on making an incifion into the limb, the upper fharp end of the lower portion of the broken bone was found confiderably drawn upward, and ftuck in the fubftance of the biceps mufcle. This circumftance will at once account for the exceffive pain which the woman fuffered whenever her arm was moved, and explains why no union took place in the fracture, the extremities of which were not at all in contact. We are not, however, to confider this caufe as a general one, which prevents the union of fractures; for in moft inftances the ends of the bone are known to touch each other fairly, and to be in the proper pofition for uniting.

We have already recorded the failure of one operation, which was performed with a view of making a broken arm unite; and, though feveral attempts of the fame kind have been made by eminent furgeons, they have all failed. Hence, at prefent, little encouragement is held out for perfevering in a proceeding which is attended with fome confiderable danger, and a vaft deal of pain, as any one may readily conceive, who reflects on what fevere fteps muft be taken in order to cut down to, turn out, and faw off the extremities of fuch fractures as intereft the arm, the thigh, or the leg.

Compound Fractures.

We have already ftated that, in the language of furgery, a *compound* fracture denotes one which is complicated with a wound in the integuments, which wound is generally occafioned by a protrufion of one of the fharp ends of the broken bone, and of courfe leads down to, and communicates with, the fracture.

The circumftance of there being this fort of injury done to the fkin makes a very material difference in the nature of the cafe, fince it increafes the danger in a manner which is always a fource of alarm to practitioners of the greateft profeffional judgment and moft extenfive experience. It is not, however, every wound which may happen to attend a fracture, that can occafion the confiderable augmentation of danger to which we have alluded. The fame violence which breaks the leg or the arm may cut, or lacerate, at the fame time, fome portion of the fkin and mufcles, more or lefs diftant from the fracture; but, provided fuch mifchief done to the foft parts is not of itfelf perilous from its extent or other circumftances, it does not produce any ferious aggravation of the fymptoms likely to arife from the fracture.

The increafed danger of a compound fracture effentially depends on the circumftance of there being conjoined with the breach of continuity in the bone *fuch a wound as makes an external opening into the fracture.*

According to Mr. Pott, the firft object of confideration in compound fractures is, "whether the prefervation of the fractured limb can, with fafety to the patient's life, be attempted; or, in other words, whether the probable chance of deftruction, from the nature and circumftances of the accident, is not greater than it would be from the operation of amputation. Many things may occur to make this the cafe. The bone or bones being broken into many different pieces, and that for a confiderable extent, as happens from broad wheels or other heavy bodies of large furface, paffing over or falling on fuch limbs; the fkin, mufcles, tendons, &c. being fo torn, lacerated, and deftroyed, as to render gangrene and mortification the moft probable and immediate confequence; the extremities of the bones forming a joint, being crufhed, or, as it were, comminuted; and the ligaments connecting fuch bones being torn and fpoiled; are, among others, fufficient reafons for propofing and for performing immediate amputation: reafons which, notwithftanding any thing that may have been faid to the contrary, long and reiterated experience has approved, and which are vindicable upon every principle of humanity or chirurgic knowledge.

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"When a furgeon fays, that a limb, which has juft fuffered a particular kind of compound fracture, ought rather to be immediately cut off than that any attempt fhould be made for its prefervation, he does not mean, by fo faying, that it is abfolutely impoffible for fuch limb to be preferved at all events; he is not to be fuppofed to mean fo much in general, though fometimes even that will be obvious; all that he can truly and juftly mean is, that from the experience of all time, it has been found that the attempts to preferve limbs fo circumftanced have moft frequently been fruftrated by the death of the patients in confequence of fuch injury; and that from the fame experience, it has been found that the chance of death from amputation is by no means equal to that arifing from fuch kind of fracture.

"Every man knows that apparently defperate cafes are fometimes cured; and that limbs fo fhattered and wounded as to render amputation the only *probable* means for the prefervation of life, are now and then faved. This is an uncontroverted fact, but a fact which proves very little againft the common opinion; becaufe every man of experience alfo knows that fuch efcapes are very rare, much too rare to admit of being made precedents, and that the majority of fuch attempts fail.

"This confideration relative to amputation is of the more importance, becaufe it moft frequently requires immediate determination; every minute of delay is, in many inftances, to the patient's difadvantage; and a very fhort fpace of time indeed frequently makes all the difference between probable fafety and fatality. If thefe cafes in general would admit of deliberation for two or three days, and during that time fuch circumftances might be expected to arife as ought neceffarily to determine the furgeon in his conduct, without adding to the patient's hazard, the difference would be confiderable; the former would not feem to be fo precipitate in his determination as he is frequently thought to be, and the latter being more convinced of the neceffity, would fubmit to it with lefs reluctance. But, unhappily for both parties, this is feldom the cafe; and the firft opportunity having been neglected, or not embraced, we are very frequently denied another. Here, therefore, the whole exertion of a man's judgment is required, that he may neither rafhly and unneceffarily deprive a patient of a limb, nor, through a falfe tendernefs and timidity, fuffer him to perifh by endeavouring to preferve fuch limb. Some degree of addrefs is alfo neceffary upon fuch occafion, in order to convince the patient that what feems to be determined upon haftily and with precipitation, will not fafely admit of longer delay."

Mr. Pott next enters into fome obfervations relative to the treatment, when it is judged prudent to endeavour to fave the limb, and he explains, that the firft object is the reduction of the fracture. He obferves, that if the bone be not protruded forth, the trouble of reducing and of placing the fracture in a good pofition will be much lefs than if the cafe be otherwife; and that, when the bone is protruded, the difficulty is always in proportion to the comparative fize of the wound through which fuch bone has paffed. In a compound fracture of the leg or thigh, it is always the upper part of the broken bone which is thruft forth. If the fracture be of the tranfverfe kind, and the wound large, a moderate degree of extenfion will in general eafily reduce it; but, if the fracture be oblique, and terminates, as it often does, in a long fharp point, this point very often makes its way through a wound only juft large enough to permit fuch extenfion. In this inftance the very placing of the leg in a ftraight pofition, in order to make extenfion, obliges the wound or orifice to gird the bone tight, and makes all that part of it which is out of fuch wound prefs hard on the fkin of the leg underneath it. In thefe circumftances, (continues Mr. Pott,) all attempts at reduction in this manner will be found to be impracticable; the more the leg is ftretched out, the more tightly will the bone be begirt by the wound, and the more will it prefs on the fkin underneath.

The above eminent furgical author next cenfures the method not unufually reforted to in this cafe, of fawing off a piece of the protruded bone. He does not, however, condemn fuch a proceeding as always or abfolutely unneceffary or wrong, but, as being fo in moft inftances. In fome few cafes, and when the end of the bone is exceedingly fharp, he acknowledges the utility of having recourfe to the faw.

Mr. Pott ftates that the two moft proper means of overcoming the impediment to the reduction are change of pofture of the limb, and enlargement of the wound. He fays that, in many cafes, the former of thefe, under proper conduct, will be found fully fufficient, and that when it fails, the latter fhould always be made ufe of. The pofition of the limb which this author advifes to be adopted is the bent one, in which he conceived the mufcles were relaxed, and the bone was lefs begirt by the wound.

When the projecting end of the fracture cannot be reduced, with the aid of a favourable pofition and proper extenfion, it becomes neceffary to make an enlargement of the wound. This operation, according to Mr. Pott, is free from danger, the fkin being the only part requiring to be cut.

When the bone is broken into feveral pieces, and any of them are either totally feparated, fo as to lie loofe in the wound, or fo detached as to render their union highly improbable, all fuch pieces ought to be taken away; but Mr. Pott very properly recommends them to be removed with all poffible gentlenefs, without pain, violence, or laceration, without the rifk of hemorrhage, and with as little poking into the wound as poffible. Any fharp, irritating points of bone on the end of the fracture fhould alfo be removed. This part of the treatment ought to be executed with great caution; for, as the foregoing furgeon judicioufly remarks, if the parts furrounding the fracture be violated, that is, be torn, irritated, and fo difturbed as to excite great pain, high inflammation, &c. it is exactly the fame thing to the patient, and to the event of the cafe, whether fuch violence be the neceffary confequence of the fracture, or of the unneceffary and awkward manner of poking into, and difturbing the wound.

In the reduction of a compound fracture, the indication is the fame as in a fimple one, *viz.* by means of a proper degree of extenfion to obtain as apt a pofition of the ends of the fracture with regard to each other as the nature of the cafe will admit, and thereby to produce as perfect and as fpeedy an union as poffible. Attention alfo to the relaxation of fuch mufcles as have the greateft power to impede and difturb the coaptation is here equally proper.

The wound being dilated, if neceffary; loofe pieces of bone removed, if there were any; and the fracture reduced and placed in the beft poffible pofition; the next thing, as Mr. Pott remarks, is to drefs the wound.

We have already ftated, that the principal part of the additional danger attendant on a compound fracture arifes from the circumftance of there being a wound which communicates with the injured part of the bone. Provided the furgeon can fucceed in uniting fuch wound by the firft intention (and this fuccefs may often be obtained), a vaft deal of the peril is at once removed, and the cafe is, as it were, all on a fudden converted into one partaking of the more mild nature of a fimple fracture. Hence, inftead of dry lint and a pledget, which Mr. Pott recommends to be applied alone,

the moſt eminent ſurgeons in London now employ ſtrips of adheſive plaſter, with which they cloſe the wound, keep its edges accurately in contact, and give it an opportunity of uniting by adheſion. In ſhort, the dreſſings are to be the ſame as thoſe commonly uſed for healing recent inciſed wounds, *viz.* adheſive plaſter, with as much or little plain lint as may ſeem proper, and whatever pledget of ſimple ointment the practitioner may chooſe.

It muſt be obvious, however, that ſince the wound of a compound fracture is produced in a rough, violent manner, by a protruſion of the end of the bone, union by the firſt intention cannot take place ſo frequently as in wounds made with a ſharp cutting inſtrument. But though it be true, that the attempt fails more often than it ſucceeds, yet the practice is not at all the leſs commendable, for it is productive of no harm, is ſometimes attended with an union of ſome part of the wound, when not with the whole, and always affords the patient his chance of ſpeedily eluding the alarming ſymptoms always apt to accompany a fractured limb, having a wound leading down to the breach of continuity in the bone. The degree of ſuch chance will always be greater, in proportion as the wounded part has ſuffered leſs of any kind of miſchief, in addition to the mere diviſion of the fibres. When the fleſh has been much torn and bruiſed, beſides being divided, the probability of the wound healing by adheſion is conſiderably diminiſhed.

Sometimes the wound may preſent ſo ragged, contuſed, and lacerated an appearance, that any man of the leaſt experience would be able to foreſee, that inſtead of union by the firſt intention, ſloughing muſt enſue. Perhaps in a few caſes of this deſcription it might be as well to give up the employment of adheſive plaſters, and have recourſe at once to the mildeſt emollient applications under the ſplints.

It too frequently happens, that the wound of a compound fracture ſuppurates ſo that it can only be healed by granulations. In this ſtate dry lint, and a pledget of any ſimple ointment, are the moſt eligible dreſſings; but others may be indicated in the progreſs of the caſe according as the aſpect and appearance of the ſore undergo changes. The lint ſhould be laid on lightly, be of the ſofteſt kind, and only in ſufficient quantity to abſorb the diſcharge. It ſhould never be crammed into the wound, nor be ſo applied as to prevent the exit of the matter. "The times of dreſſing," (ſays Pott,) "muſt be determined by the nature of the caſe; if the diſcharge be ſmall or moderate, once in twenty-four hours will be ſufficient; but if it be large, more frequent dreſſing will be neceſſary, as well to prevent offence, as to remedy the inconveniences ariſing from a great diſcharge of an irritating, ſharp ſanies."

Mr. Pott diſapproved of the general plan of enveloping compound fractures from the very firſt in ſoft, warm, relaxing poultices, which, he thought, ought only to be uſed when the limb is actually in a tenſe, ſwollen, and painful ſtate. When the parts were not in this ſituation, he was of opinion, that the prevention of inflammation formed the grand indication, for which object he adviſed the employment of diſcutient applications, ſuch as mixtures of ſpirit of wine, vinegar and water with ſal ammoniac, the aqua ammoniæ acetatæ, aqua lithargyri acetati, and medicines of this claſs, in whatever form the ſurgeon might prefer.

Theſe latter remedies were to be aſſiſted with the uſual antiphlogiſtic means, particularly phlebotomy. With regard to bleeding, in caſes of compound fractures, we have to obſerve, that although it appears to have the authority of Pott in its favour, all the moſt celebrated ſurgeons now agree, that patients in large cities and hoſpitals will not bear this evacuation. In country practice, however, circumſtances are different, and veneſection may be performed, and that repeatedly, not only with ſafety, but with the moſt ſtriking advantage. When a patient who has met with a bad compound fracture of the leg happens to be in London, and eſpecially if he is alſo in an hoſpital there, the loſs of blood by the lancet too often makes him totally incapable of bearing the long and copious diſcharge which frequently enſues, and brings him into the extreme ſtate of debility.

Compound fractures ought generally to be dreſſed every day when they are in a ſuppurating ſtate. In doing this, the limb ſhould not be moved in the leaſt, or only ſuffer ſuch diſturbance as is utterly unavoidable. Surgeons have long been acquainted with the ſuperior advantage of the eighteen-tailed bandage in theſe inſtances, although it was not till the time of Pott that it came into common uſe for ſimple fractures. The reader already knows that its great recommendation is the manner in which it admits of being opened, ſo as to allow the limb to be looked at without the ſmalleſt motion of the fractured part.

The obſervations, which have been made on the ſubject of ſplints, and the poſition of the limb, in our general remarks on fractures, are all applicable here.

Of all caſes, compound fractures require at firſt the moſt rigid obſervance of the antiphlogiſtic regimen. As Mr. Pott ſtates, pain is to be appeaſed, and reſt obtained by anodynes; inflammation is to be prevented or removed by free and frequent bleeding (out of large cities and hoſpitals), by keeping the body open, and by the adminiſtration of ſuch medicines as are beſt known to ſerve ſuch purpoſes. In this firſt ſtage alſo, the treatment of the limb muſt be calculated either for the prevention of inflammatory tumefaction, by diſcutient applications, or for the removal of ſwelling and tenſion, when they have already come on, by fomentations and emollient remedies.

When the foregoing mode of treatment ſucceeds, the wound either unites by the firſt intention, heals in a quiet manner with an inconſiderable degree of ſuppuration, or elſe it is at firſt attended with great and extenſive inflammation, which leads to the formation of large abſceſſes and lodgments of matter. When the attempts of the ſurgeon fail, the limb is ſeized with mortification.

If the wound heals favourably, the ſurgeon has only to avoid doing miſchief, either by his manner of dreſſing, or by diſturbing the limb. Mr. Pott obſerves that nature unmoleſted will accompliſh her own purpoſe, and art has little more to do, than preſerve the due poſition of the injured part.

When large quantities of matter form and lodge, the utmoſt exertion of the judgment will ſometimes be neceſſary in the treatment of the caſe. "Enlargement of the preſent wound, for the more convenient diſcharge of matter, new or counter-openings, for the ſame purpoſe, or for the extraction of fragments of broken or exfoliated bone, will very frequently be found neceſſary, and muſt be executed." Mr. Pott expreſſes his preference of a counter-opening to a compreſs, which has occaſionally been uſed, with a view of preventing the lodgment of matter, and which ſometimes acts diametrically oppoſite to the intention with which it is uſed, beſides requiring more preſſure to make it efficacious than a limb, in ſuch circumſtances, can generally bear.

While the firſt or inflammatory ſtage of a compound fracture laſts, and large abſceſſes have not taken place, the antiphlogiſtic treatment is indicated. No ſooner has ſuppuration occurred, and extenſive collections of matter formed, than all evacuations ſhould be diſcontinued, and the patient's ſtrength be ſupported with all poſſible aſſiſtance from diet and medicines.

The

The detention and irritation of a splinter of bone have been known to keep up a large, disagreeable discharge for a considerable length of time. Mr. Pott obferves, that if fuch difcharge be made, and there be neither finus nor lodgment to account for it, and all other circumftances are favourable, an examination fhould always be made, in order to know whether fuch caufe does not exift, and if it does, it muft be gently and carefully removed.

In cafes of bad compound fractures, attended with a great deal of fuppuration, the difcharge fometimes becomes too profufe for the patient to bear, notwithftanding the moft fkilful treatment, and he is neceffitated to part with his limb, as the only means of faving his life, after undergoing very fevere fufferings. In fpeaking of this fubject, Mr. Pott has occafion to remark, that he never had found it neceffary to amputate a limb for a compound fracture, on account of the profufe difcharge, when fuch fracture was in an united ftate. Though amputation is fometimes rendered indifpenfable in fpite of the beft treatment, yet this eminent furgeon was convinced, that the neceffity for fo fevere a proceeding was occafionally produced by reducing the patient too much. On finding all febrile complaint at an end, all inflammatory tumour and hardnefs gone, the patient rather languid than feverifh, the pulfe rather weak and low, than hard and full, the appetite fail, an inclination to fweat and be purged, without affignable caufe, and this in confequence of a large difcharge of matter from a limb, which has fuffered great inflammation, but which has now become rather foft and flabby than hard and tumid, we are recommended to fupport the patient *totis viribus*.

When an endeavour is made to fave a limb, which has fuffered a compound fracture, and the attempt fails from the very firft, gangrene and mortification are the confequences arifing, fometimes from the mifchief done to the limb at the time that the bone is broken, fometimes from the laceration of the parts made by the protrufion of the bone.

Mortification may alfo be occafioned by improper treatment, fuch as violent extenfion, irritation of the wounded parts with the probe, painful dreffings, improper difpofition of the limb, and the neglect to give ufeful medicines. Mr. Pott notices that all, or any of thefe caufes may either induce fuch a ftate of inflammation as fhall end in gangrene, or may permit the inflammation neceffarily attendant upon the accident, to terminate in the fame event.

When the mortification is the mere confequence of the injury done to the limb, Mr. Pott has explained, that it generally makes its appearance very early, and its progrefs is too rapid for art to check. Hence when this kind of diforder is likely to enfue, no time can be fpared; the impending mifchief muft either be fubmitted to, or prevented by early amputation. A few hours (fays the above writer) make all the difference between probable fafety and deftruction. If we wait till the difeafe has taken poffeffion of the limb, even in the fmalleft degree, the operation will ferve no purpofe, but that of accelerating the patient's death. The gangrene always extends higher up the interior, than the fuperficial part of the limb, and when once begun, it can never be ftopped by amputation.

Therefore when the firft opportunity of performing the operation has been neglected, the attempt fhould not be thought of while the mortification is in a fpreading ftate; but the practitioner fhould now endeavour, by all poffible means, to affift nature in feparating the dead from the living parts. It is a lamentable truth, however, that in this ftate of things the patient generally dies, and his life falls a facrifice to an injudicious effort to fave his limb.

When the mortification is not the immediate effect of the mifchief done to the limb by the accident; but is the confequence of high inflammation, badnefs of general habit, wrong treatment, &c. the progrefs of the diforder may fometimes be checked and ftopped, and the dead parts feparated from the living ones, by adopting fuch means as each particular cafe may require. Inflammation will ftand in need of antiphlogiftics, pain and irritation of anodynes, and bark, joined fometimes with cooling, fometimes with cordial, medicines will be proper. The external applications ought to confift in fomentations, emollient poultices, and dreffings of the moft lenient kind.

But we need not fpeak further on this part of the fubject, as whatever more is neceffary to be known will be explained in other places. See GANGRENE, MORTIFICATION, SPHACELUS.

We fhall finifh thefe remarks on compound fractures with a citation from an author, whofe works abound with the richeft practical information. "There are three points of time, or three ftages of a bad compound fracture, in which amputation of the limb may be neceffary and right, and thefe three points of time are fo limited, that a good deal of the hazard or fafety of the operation depends on the obfervance, or non-obfervance of them.

"The firft is immediately after the accident, before inflammation has taken poffeffion of the parts. If this opportunity be neglected, or not embraced, the confequence is either a gangrene, or a large fuppuration with formation and lodgment of matter. If the former of thefe be the cafe, the operation ought never to be thought of, till there is a perfect and abfolute feparation of the mortified parts. If the latter, no man can poffibly propofe the removal of the limb, until it be found, by fufficient trial, that there is no profpect of obtaining a cure without, and that by not performing the operation, the patient's ftrength and life will be exhaufted by the difcharge. When this becomes the hazard, the fooner amputation is performed the better. In the firft inftance, the operation ought to take place before inflammatory mifchief is incurred; in the fecond, we are to wait for a kind of crifis of fuch inflammation; in the third, the proportional ftrength and ftate of the patient, compared with the difcharge and ftate of the fracture, muft form our determination." See Pott on Fractures.

Particular Fractures.

Fractures of the Offa Nafi.—The fituation of the offa nafi expofes them very much to external violence; but the manner in which they are implanted between the afcending proceffes of the upper maxillary bones, and the way in which they are fupported by the vomer and os frontis, are reafons why they are not fo frequently fractured by blows and falls, as would otherwife be the cafe. However, they do fometimes give way, and become depreffed and feparated from the adjacent bones. Both of them are not always broken at the fame time. In certain inftances, one is found fractured all acrofs, while the other is only elevated, or beaten inward, without there being in it any breach of continuity. A fracture of the offa nafi is not unfrequently attended with a fimilar injury of the perpendicular lamellæ of the os ethmoides, in which event, the latter procefs is invariably driven to one fide or the other, and may eafily be moved either with the little finger or a probe introduced into the noftril. A fracture of the offa nafi is often accompanied by ferious fymptoms, inflammation of the pituitary membrane, fwelling of the nofe and face, more or lefs ophthalmy, and occafionally a bleeding which cannot eafily be ftopped. The refpiration alfo fometimes feems oppreffed; and when the violence

lence of the blow has been such as not to have entirely spent itself on the fracture, but to have extended to the cribriform lamella, the effects of a concussion of the brain sometimes ensue, and even an extravasation may happen within the cranium, as is proved by the testimony of the best observers. A fracture of the nose may easily be distinguished from the very first. The diagnosis, however, is more obscure when inflammation and swelling have taken place; but, upon the whole, we may state that the nature of the accident may always be ascertained with facility.

The treatment of the case consists in replacing the deranged pieces of bone, by means of a probe, or any other suitable instrument, introduced up the nostril. Thus the fragments may be moved as far outward as necessary, while the surgeon, applying the index finger of his left hand externally, endeavours to prevent any preternatural projection. The same plan must be adopted on both sides of the nose, when the two ossa nasi are fractured at once, and the broken pieces displaced. When the septum nasi is thrown out of its due position, it must be rectified with any convenient instrument, care being taken not to pass such instrument too far, or forcibly, upward, for fear of injuring the delicate transverse lamella of the os ethmoides.

Should the efforts of the surgeon be interrupted by the patient's sneezing, it will be necessary to wait a little before repeating the attempt.

When the fracture is attended with a wound of the integuments, and the fragments of bone are so detached as to leave no hope of their re-union, they ought to be extracted with as much care and as little irritation as possible.

When the fracture is simple, and not at all displaced, the treatment is limited to general means for averting and diminishing inflammation.

In other instances, in which the pieces of bone slip out of their right position, the fragments should be supported with a bit of hollow bougie, surrounded with lint and introduced up the nostril. Writers also recommend, for the same purpose, a piece of quill cut open at each end and wrapt round with agaric, which, they say, tends to check the troublesome hemorrhage generally attending such cases. This latter duty agaric may probably fulfil with about as much certainty as lint, which, being always at hand, is therefore to be preferred.

Hollow tubes, of some kind or another, are certainly better than the solid substances used by Hippocrates, and also preferable to the patient's fingers, which the same author employed in the majority of instances. Forestus imitated Guy de Chauliac in advising the use of cannulæ, on the ground that they both facilitated respiration, and aided in keeping the parts from falling inward.

The fragments of the fracture having been replaced, linen wet with the saturnine lotion should be applied, and compresses laid on each side of the face, in the hollow between the cheeks and the nose. These applications are to be kept in their respective places with a roller.

A force, which breaks the ossa nasi, may also beat inward the cribriform lamella and the crista galli of the os ethmoides, so as to occasion a dangerous degree of pressure on the brain. When the symptoms, and the extent to which the ossa nasi are depressed, lead the surgeon to suspect the mischief which we have just now mentioned, an immediate endeavour should be made to draw downward and forward the cribriform lamella and crista galli, which object might perhaps be most conveniently accomplished by introducing a pair of small common forceps into each nostril, and pressing the two instruments together against the nasal process of the ethmoid bone, which, by their means, could then be pulled downward and forward.

Fractures of the lower Jaw.

Although the lower jaw-bone is moveable, consequently, capable of yielding to such force as is likely to injure it, and notwithstanding it is sufficiently compact to make considerable resistance, yet it is a bone which is frequently broken. The fracture may be situated either in its body or its branches, and be displaced or not. It is principally when the solution of continuity happens near the posterior angle, that neither of the broken surfaces is thrown out of its due position; for in this case, the pterygoid, temporal, and masseter muscles keep up the back part of the bone in such a manner, that the sterno-hyoidei and digastrici are prevented from drawing downward the anterior middle portion. A fracture of the lower jaw may be ascertained by putting a finger into the mouth, upon the front teeth of the side on which the accident is suspected, and by pressing upon them at the same time that the fingers of the other hand are applied along the base of the jaw towards the angle of the same. When pressure is now alternately made with each hand, the surfaces of the fracture will move, and often occasion a distinct crepitus. The diagnosis is much more plain when the fracture is displaced, for if the body of the bone separates from the ramus, and falls downward, the mouth is found wide open, and drawn to one side in such a way, that the commissure of the lips is considerably inclined downward, while the back teeth remain much higher than the front ones. If the ends of the fracture ride over each other, the mouth will appear wider on the side where such circumstance has occurred, and will project more forward. The teeth, also, instead of being arranged in the same line, will be, some displaced inward, others outward.

The generality of fractures of the jaw are attended with a considerable degree of swelling and ecchymosis. In consequence of the contusion and laceration which the soft parts sustain, very bad symptoms sometimes arise.

In certain instances, either paralysis, or a convulsive affection of the cheek of the same side is induced, by the injury done to the nerve which runs in the canalis mentalis, and has numerous communications with the portio dura of the seventh pair. According to writers, the hearing may be more or less impaired; a kind of tinnitus aurium occasioned; ophthalmy excited; a profuse discharge of saliva from the mouth brought on; and convulsive motions of the lips produced.

The fracture is sometimes displaced, sometimes not. In the latter case, it is only necessary to keep the injured bone well supported against the os maxillare superius, by applying a compress on the side, on which the accident has occurred, and retaining such compress in its situation by means of Galen's bandage, made either with four or six tails, and applied with its middle to the chin, while the extremities of its tails are to be pinned to the patient's night-cap.

This bandage, which is one of the best used in surgery, and celebrated for its antiquity, is described in another part of this work. See Bandage.

When the fracture is displaced, the plan to be followed is not quite so simple. If the anterior portion of the bone be situated lower down than the posterior, the index finger must be put against the root of the coronoid process, which part is to be gently pushed backward, while the index and middle-fingers of the other hand are applied to the front teeth, and the thumb under the chin. The latter part is to be raised at the same time that the back portion of the bone

bone is pushed back, so that the two pieces are replaced together.

In cases in which one of the two portions is forced over the other, the fingers are to be placed, as above directed, and one piece of the bone is to be pushed backward, the other forward, until the surfaces of the fracture are evenly in contact. This event may be ascertained by the touch, by the disappearance of deformity, and by the regularity in the arrangement of the teeth.

It very frequently happens, that a tooth is situated exactly in the course of the fracture. In this circumstance, the generality of surgical writers direct us to regard the loosened tooth in the light of an extraneous substance, likely to be productive of harm, and consequently requiring removal.

It also often occurs, that one or more teeth, situated in the vicinity of the fracture, are driven out of their sockets. In this case, we are to replace the teeth without delay, and fix them in their proper places by tying them to the neighbouring ones. Celsus recommends this method, in the following terms, "si hi labant (dentes), ulteriores inter se seta deligandi sunt." Hippocrates advises the use of a piece of golden wire for the purpose.

Having set the fracture as evenly as circumstances will allow, the next object is to apply the apparatus, by which the broken bone is to be kept from becoming displaced again. Custom sanctions the application of a piece of soap-plaster to the integuments covering the fracture, though we should have some difficulty to offer any good reason for the practice, except neatness of appearance; for, with regard to efficacy, there can be none.

Several oblong compresses are next to be prepared, in one of which a piece of pasteboard is to be put. These may be wet with some discutient lotion, such as that made of the aqua lithargyri acetati, or the one composed of vinegar, sal-ammoniac, and spirit of wine. After the compresses have been applied, in such manner as seems best calculated for keeping the fracture from becoming displaced, they are to be retained in their place with Galen's bandage, made either with four, or six tails.

The bandage alluded to is an exceedingly ancient one, being mentioned by Celsus, in treating of the fractured jaw. "Mollis habena (says he) media in longitudinem incisa, ut utrinque mentum complectatur, et inde capita ejus supra caput adducta ibi deligentur."

During the whole of the treatment, the patient must refrain from making any attempt to move his jaw, and he ought to be fed with a spoon, and only have such nourishment as does not stand in need of mastication. When the fracture is complicated with a wound, the dressings should be changed with the utmost care, and as seldom as circumstances will permit. While the apparatus is off, an assistant must attentively support the fractured bone, until the bandage is put on again.

Hippocrates considered it highly necessary, in the course of the case, to feel the inside of the mouth tolerably often, in order to ascertain the state of the fracture, and rectify it when displaced.

Fractures of the jaw are generally united in about three weeks; at the end of which time, the patient may commonly be allowed to converse, and even to leave off the bandage.

In an instance, in which the lower jaw was fractured by a pistol being discharged in the mouth, Default passed a hollow bougie down the pharynx from the left nostril. The instrument was fastened in this situation with a ligature, the ends of which were pinned to the patient's night-cap. Thus food and medicines were injected into the stomach, without any disturbance or motion of the jaw. The plan is certainly deserving of imitation in every bad case.

Fractures of the jaw are very apt to be followed by troublesome abscesses, and tedious exfoliations.

Fractures of the Zygoma.

The zygoma, which extends from the outside of the temporal bone to the os malæ, seems, from its situation, more exposed to fractures than all the other bones of the face. However, as far as our experience goes, it is not very often broken, and, beyond a doubt, it is much less frequently injured in this way, than either the lower jaw, or the frontal bone.

Two examples of the zygoma being fractured are related by Duverney in his "Traité sur les Maladies des Os." In one of these cases the fragments were depressed against the temporal muscle; in the other, one portion projected outward. These differences must have arisen from the particular way in which the blow had acted in each instance. The patient was incapable of depressing the lower jaw, without considerable suffering; the pain in the situation of the fracture was very great; the temporal muscle was exceedingly tense; and the face was somewhat convulsed, a circumstance which the author imputed to the pressure made on the branches of the portio dura of the seventh pair of nerves. In the patient to whom we have first alluded, there was felt, in the place which had been struck, a kind of hollow, which was occasioned by the depression of the fragments of bone. The hollow became still more evident, when the index finger was introduced into the mouth, considerably above the grinding teeth of the upper jaw, and then pushed from within outward. Duverney, finding it impracticable to elevate the pieces of bone with his finger, introduced a flat bit of wood about as large as a finger over the grinding teeth, as far back as he could, and made the patient firmly shut the jaw. The pressure made by this sort of wedge, between the coronoid process and the zygoma, made the latter gradually resume its natural position, care being taken to use a thicker piece of wood, in proportion as the broken part became more and more replaced.

In the second case, the projecting portion of the zygoma was easily restored to its proper place, by pressure. The applications and bandage were simply retentive.

Fractures of the Vertebræ.

Blows, falls, the passage of heavy carriages over the trunk, and particularly gun-shot wounds, are causes capable of producing fractures of the vertebræ. These bones, however, are so thick, short, and strong, and so surrounded with masses of muscle, that, with the exception of the projecting spinous processes, they are not frequently broken, and indeed can only be thus injured by great violence, directed in a particular manner.

Fractures, both of the spinous processes, and of the corpora vertebrarum, are generally alarming cases, on account of the afflicting symptoms which commonly ensue. The danger does not absolutely originate from the mischief done to the bone; but from the concussion of the spinal marrow, occasioned by the external violence, or from the compression or laceration of the same part, arising from some of the fragments of bone being driven against it. The injury, indeed, which the parts within the spinal canal often sustain, is so great, that, if the patient lives a certain time, they often inflame, and a large quantity of matter is formed around the continuation of the dura mater, which covers the medulla spinalis.

Cocchi,

Cocchi, an Italian practitioner, has noticed all the bad ſymptoms with particular preciſion. In ſpeaking of the bony fragments, he obſerves, " officulis comminutis, medullam per ea deſcendentem comprimi, pungi atque inflammari neceſſe eſt, et ſubjectas corporis partes univerſas reſolvi ac veſicæ et recti inteſtini vim conſtringentem amitti, adeo ut urina et excrementa vel ſupprimantur, vel ſine voluntate prorumpant. Quâ certiſſimâ atque evidentiſſimâ notâ, nos ſæpe conjecimus vertebræ alicujus proceſſum ſpinoſum introrſum confractum fuiſſe; et quum plerumque vel cita vel tarda inſecuta ſit, inciſis corporibus, id mali ſolum fuiſſe vidimus, etſi nullo modo vertebræ exciderint. Antiqui id parum perſpexiſſe videntur, a quibus noxæ et pericula vertebris luxatis tribuuntur, quæ revera fractarum ſunt. Hoc infortunium longe frequentius quoque quam illud accidere comperimus, ſecùs ac illi putarunt." Notwithſtanding the ſentiment of the foregoing author, that ſuch ſymptoms are particularly apt to proceed from a fracture of ſome of the ſpinous proceſſes, it is certain, that the more common cauſe is a fracture of the corpora vertebrarum, the damage done to which is often irremediable.

Practitioners, however, ought to be appriſed, that a ſimilar train of evils may depend altogether on a concuſſion of the ſpinal marrow, without any fracture whatever. This fact, in caſes in which the bodies of the vertebræ are ſuſpected to be broken, always throws an immoveable degree of doubt and obſcurity over the real ſtate of circumſtances. A fracture of the ſpinous proceſſes may often be diſtinctly felt; but that of the other parts of the vertebræ in general only admits of ſuſpicions, which can never be confirmed, except where the fatal termination of the caſe gives the ſurgeon an opportunity of opening the body.

It was a circumſtance obſerved by Albucaſis, that fractures of the upper vertebræ are, for the moſt part, attended with a paralyſis of the upper extremities, while fractures of the lumbar vertebræ were generally productive of a paralytic affection of the lower ones. Avicenna remarks, that ſuch injuries of the corpora vertebrarum always occaſion death, which ſeldom enſues from a mere fracture of one or more of the ſpinous proceſſes. The latter kind of accident, indeed, has been known to occur, and the fragments of bone to be at the ſame time diſplaced, without the acceſſion of any alarming ſymptoms. The caſe is always to be regarded as much leſs dangerous than one in which any other part of the vertebra is broken.

Notwithſtanding the opinion delivered by Avicenna, it is certain that a fracture of the body of a vertebra is not neceſſarily fatal in every inſtance, eſpecially when the accident has ariſen from a gun-ſhot wound. Several examples, confirming the truth of this remark, are to be met with in ſurgical books. In the majority of examples, however, the patients linger, and die of a ſlow ſort of fever.

When the bodies of any of the vertebræ are fractured, the practitioner only has it in his power to render himſelf uſeful, by paying attention to general indications. Circumſtances, however, are different, when the ſpinous proceſſes are broken. In theſe inſtances an endeavour is to be made to put the detached fragments of bone in their right ſituation; an object which may ſometimes be accompliſhed, when the parts make a conſiderable projection.

Writers on ſurgery alſo ſpeak of uſing an elevator for raiſing depreſſed pieces of fractured vertebræ, when the accident is complicated with a wound; of this practice we can ſay nothing ourſelves, ſcarcely being able to conceive that any opportunity for it can occur, or that the thing is very practicable.

In caſes of fractured vertebræ a roller may be applied round the body, and kept from ſlipping down by a ſcapulary; but it is plain, that ſuch an apparatus is more for the ſake of appearances, than of any real efficacy. When the ſpinous proceſſes are broken, the compreſs ought to be put under the bandage along each ſide of the detached fragments.

All injuries of the ſpine are apt to produce paralyſis of the lower extremities, and of the bladder and rectum. Hence the patient is frequently incapable of voiding his urine, and the practitioner is obliged to have recourſe to the catheter. In many caſes the urine comes away without the patient's knowledge, and the fæces are alſo involuntarily diſcharged. See INCONTINENCE *of Urine*, and RETENTION *of Urine*.

Fractures of the Sternum.

When the ſternum is broken, it is generally in conſequence of a very violent fall againſt ſome hard projecting body. The accident being produced in this manner, the fragments of bone ſeldom continue exactly in their natural poſition, but are almoſt always more or leſs diſplaced, and, by making preſſure on the neighbouring parts, give riſe to ſymptoms of an urgent nature. Sometimes the violence of the blow ruptures one of the internal mammary arteries, ſo that an extravaſation takes place, and brings on a train of alarming complaints. Such an effuſion of blood, however, is more frequently attendant on gun-ſhot injuries of the ſternum, than common fractures. The patient does not in the firſt inſtance experience conſiderable ſuffering, becauſe the extravaſation occurs ſlowly, and the layers of the mediaſtinum make a good deal of reſiſtance to the diffuſion of the blood. At length, however, the quantity effuſed becomes very great, and an exceſſive difficulty of breathing, and a ſenſe of weight in the region of the ſternum, are the conſequences. It is ſaid that on examining the integuments covering the bone, a kind of incipient œdema may be felt, which ſhould draw the ſerious attention of the practitioner to the effects which are likely to enſue.

When the mammary veſſels are uninjured, and the above ſort of ſymptoms ariſe, they are much later in making their appearance. They are alſo dependant, not on an effuſion of blood, but on the formation of abſceſſes in the vicinity of the fracture, and beneath the bone. Such purulent collections have alſo been compared by ſurgical authors, with the ſuppurations which ſo frequently happen under the cranium in conſequence of injuries of the head, from external violence. The writings of Juncker, Duverney, and J. L. Petit, ſhew the truth of this obſervation. Verduc, who refers the bad ſymptoms to the pieces of bone being driven inward, and recommends the fragments to be elevated, deſcribes the complaints as even more dangerous, and more ſpeedily fatal than thoſe which are produced by blood or matter under the cranium.

When the fracture of the ſternum is a ſimple one, unattended with any particular complaints, has been occaſioned by a fall or blow, and the fragments are not at all diſplaced, the treatment is reduced to great ſimplicity. The patient is to be kept on a low regimen, at perfect reſt, and ſhould be bled and purged according to the exigency of the caſe. The topical part of the treatment conſiſts in applying ſome ſoap-plaſter to the ſituation of the injury, and a roller round the body, with a ſcapulary.

When any portion of the fractured ſternum is beaten inward, ſo as to preſs upon and dangerouſly irritate any of the ſubjacent parts, the depreſſed piece ſhould be raiſed without loſs of time. For this purpoſe, it will generally be neceſſary to make a diviſion of the integuments with a ſcalpel

ſcalpel, and then to employ the inſtrument called an elevator, much in the ſame way as it is uſed on the ſkull. See ELEVATOR and TREPANNING.

In gun-ſhot wounds of the thorax, the ſternum may be ſhattered into many pieces. In ſuch a caſe, it would be the duty of the practitioner to remove, with a pair of forceps, all the detached fragments, which, if left in the wound, would not unite to the reſt of the bone; but only act as extraneous bodies.

Where an extravaſation of blood, or a collection of purulent matter, under a fractured ſternum, are known to exiſt, and to be the cauſe of urgent and perilous ſymptoms, the ſurgeon would be called upon to make a perforation in the bone with a ſmall trephine. However, before having recourſe to this proceeding, he ought to be ſure that the bad ſymptoms do depend on the preſence of a fluid in the anterior mediaſtinum, and are not altogether the effect of inflammation conſequent to the violence.

We ſhall conclude theſe remarks on fractures of the ſternum with ſtating, that as the chief danger of ſuch caſes is in proportion to the irritation and inflammation which are excited in the thoracic viſcera, the principal objects in the treatment are, to prevent the broken pieces of bone from hurting the pleura, pericardium, and lungs, by projecting inward, and to avert inflammation in the cheſt, as much as poſſible, by repeated veneſections, low diet, quietude, aperient medicines, &c.

Fractures of the Ribs.

The ribs are broken almoſt as frequently as any bones of the human body. The labourer who falls from a ſcaffold, the poor fellow who is run over by a carriage, the man of pleaſure who is thrown from his horſe, the ſailor who tumbles from aloft, and all deſcriptions of perſons ſubject to falls in running up and down ſtairs and ladders, are often under the ſurgeon's care for fractured ribs. Only one of theſe bones may be broken, but in many caſes the accident befals ſeveral at the ſame time. The part of the ribs where fractures are moſt commonly ſituated is their greateſt convexity, which muſt obviouſly be the moſt expoſed to the effects of external violence.

The falſe ribs are not ſo apt to be fractured as thoſe which have the epithet true given to them. The reaſon of this circumſtance is owing to the moveable nature of the former, a quality which enables them to elude the conſequences of external force. The guarded ſituation of the firſt true rib beneath the clavicle is alſo a cauſe why it is very ſeldom broken.

The diagnoſis of fractures of the ribs is ſometimes ſufficiently plain, but in numerous inſtances the moſt diſcerning ſurgeon can obtain no certainty. When the patient is thin, when ſeveral ribs are fractured, and particularly when the ends of the fracture are diſplaced inward or outward, the practitioner is always able to aſcertain the nature of the accident, beyond the ſhadow of a doubt. Under theſe circumſtances, a crepitus may alſo be felt on making the patient cough, ſo as to ſhake the injured bones, and at the ſame time placing one's hand upon the hurt ſide of the thorax.

However, more obſcurity often prevails, when the patient is fat, when only a ſingle rib is broken, and when the ends of the fracture are undiſplaced. A pricking ſenſation in the ſide, attendant on the motion of the ribs in reſpiration, is frequently a juſt ground of ſuſpicion, that one of theſe bones is fractured, eſpecially when the nature of the fall, or blow, makes the accident not improbable. In all caſes of doubt, the prudent ſurgeon makes it an invariable maxim to act in the ſame way as he would do were he certain that the ribs are broken. This line of conduct is particularly commendable; becauſe it can do no harm, ſuppoſing no fracture to exiſt, and when ſuch an injury has really happened, the relief and the prevention of dangerous conſequences, reſulting from the adoption of the proper treatment, are of the greateſt importance.

The practice, in caſes of fractured ribs, conſiſts in diminiſhing the motion of theſe bones as much as poſſible, taking meaſures for the hindrance and diminution of inflammation of the pleura and lungs; and, in particular, in appeaſing any cough under which the patient may happen to be ſuffering.

The firſt of theſe indications is fulfilled by means of a roller applied round the thorax as tightly as the patient's feelings will permit. Inſtead of a roller, the generality of ſurgeons rightly prefer employing a ſtrong piece of linen, large enough to ſurround the cheſt, and laced with due tightneſs in front of the body. Such an apparatus is not ſo apt to become ſlack as a roller, and it has this advantage, that the patient himſelf, in the abſence of the ſurgeon, can eaſily increaſe or diminiſh the tightneſs of the cloth, as circumſtances may require. Before putting on any kind of bandage, however, the ſurgeon ſhould examine the ſituation of the fracture, and put the ends of the bone, or bones, as nearly as poſſible into a right poſition. This object is to be effected by making ſkilful preſſure with the fingers on the injured ribs. It is uſual alſo to apply a piece of the ſoap-plaſter to the integuments in the vicinity of the fracture. Together with ſuch application, one or two compreſſes may be uſed, if the practitioner is of opinion that they will be of any ſervice in keeping the ends of the bone, or bones, ſteady, and in their proper poſition.

Whether the bandage conſiſt of a common roller, or a broad piece of cloth laced in front, a ſcapulary muſt be employed for the purpoſe of preventing the apparatus from ſlipping downward.

One of the principal dangers ariſing from fractures of the ribs, is inflammation of the pleura, or membrane which lines the cheſt. Hence the ſecond indication which we above ſpecified, and which is fulfilled by ſtrict attention to the antiphlogiſtic ſyſtem of treatment. Indeed, all experienced ſurgeons, on being firſt called to a patient having a fractured rib, or ſuſpected of having ſuch, make it a rule to direct immediate veneſection, and to take away about ſixteen or eighteen ounces of blood. The evacuation is to be repeated or not, according to circumſtances. It is only in very debilitated, aged ſubjects, that it is right to diſpenſe with bleeding.

Sometimes the point of a fractured rib, by being beaten inward, lacerates ſome of the air-cells of the lungs. In conſequence of this accident, a portion of the air contained in theſe organs inſinuates itſelf between the pleura pulmonalis and pleura coſtalis every time that the cavity of the cheſt is enlarged in inſpiration, and thence partly eſcapes into the common cellular membrane of the body through the breach in the pleura coſtalis, on every diminution of the thorax in expiration. The ſwelling of the parts which are thus inflated with air, is termed emphyſema, and frequently takes place in a degree almoſt incredible, the cellular ſubſtance becoming ſo diſtended as to be in many parts of the body ſeveral inches thick. The principal danger, however, is not from this diffuſion of air; but from its confinement in the cheſt, where it often accumulates more quickly, than it can eſcape through the laceration in the pleura, and conſequently produces ſuch a degree of preſſure on the mediaſtinum, diaphragm, and oppoſite lung, that a

fatal

fatal interruption of refpiration is occafioned. We need not fay more at prefent concerning this affection, as it is treated of elfewhere. See EMPHYSEMA.

Another occafional attendant on bad cafes of fractured ribs, is an extravafation of blood in the cavity of the cheft. Such an effufion and an emphyfema we have, in certain inftances, found exifting together. The reader will find fome obfervations on extravafation in the cheft, in the articles EXTRAVASATION and WOUNDS.

Fractures of the Os Ilium, Os Ifchium, and Os Pubis.

The ftructure of the os ilium and os ifchium is fuch, and the mufcles upon them are fo numerous and bulky, that fractures of thefe bones hardly admit of being felt, except when fituated about the upper part of the ilium, or the tuberofity of the ifchium. Neither thefe bones, nor the os pubis, however, are very frequently broken, and when the accident does happen, it is almoft always in confequence of gun-fhot injuries, or the paffage of heavy carriage-wheels over the pelvis. Boyer has recorded an inftance in which the anterior fuperior fpinous procefs was fractured by the kick of a horfe. It is eafy to conceive that the fame defcription of violence might alfo break either the os pubis, or the crifta of the ilium. As great violence is generally requifite to produce the breach of continuity, the integuments and mufcles are commonly feverely injured at the fame time, as well as the vifcera of the pelvis. Indeed, the danger of thefe accidents may be eftimated by the degree of mifchief done to the internal parts, for it is from this caufe that a fatal inflammation of the bladder, inteftines, and peritonæum, and a train of afflictions depending on a paralytic affection of the urinary organs frequently originate.

When the os ilium is fractured all acrofs, the accident may in fome inftances be detected by making preffure on the crifta of this bone, by which means a crepitus may fometimes be rendered perceptible. The fragments of the fracture are very feldom difplaced, being retained in their proper fituation by the glutæi and iliacus internus mufcles.

In order to difcover fractures of the os ilium, the furgeon fhould make the patient lie on that fide of the body which is free from injury, with the thorax and abdomen inclined forward, and the thighs bent.

When a fufpicion is entertained that the os pubis is fractured, the examination fhould be made while the patient lies upon his back with his cheft inclined forward, and his thighs in a ftate of flexion.

Fractures of the os ifchium may be difcovered by examining juft under the lower edge of the buttock, by the fide of the anus.

The fwelling which occurs very often renders all information, derived from handling the parts, exceedingly obfcure and doubtful. In this circumftance, the practitioner can only conjecture that a fracture of fome part of the pelvis has happened from a confideration of the fymptoms. Thefe are generally of the following defcription; a difficulty of walking, in confequence of a blow, or fall on the pelvis, or of the paffage of a carriage over it, a retention of the urine and fæces, followed by an incontinence of the fame, oppreffive pains, a paralytic affection of the thighs and legs, œdema of thefe parts, and even floughing. Very often, in confequence of the violence done to the vifcera, hiccough and vomiting are excited, and extravafations of blood, and collections of matter are produced.

The majority of fuch patients as we have known die from fractures of the os ilium, os ifchium, and os pubis, have fallen victims to extenfive inflammations in the pelvis and abdomen.

We have already remarked, that the fractures themfelves are feldom difplaced, fo that what relates to their treatment is exceedingly fimple, merely confifting in applying a roller round the pelvis, and putting a piece of foap-plafter on the fituation of the broken part. The grand indication is to obviate the confequences of inflammation of the parts within of the pelvis, and of the peritonæum and abdominal vifcera, by copious and repeated venefections, and the application of leeches and blifters to the hypogaftric region, on the very firft occurrence of pain or tenfion.

All complaints, in regard to the evacuation of the urine and fæces, are alfo to be carefully attended to. The furgeon muft never neglect to employ the catheter as often as circumftances require, and he fhould endeavour to devife proper means for preferving a due degree of cleanlinefs, which is fo effential to the recovery of perfons likely to undergo a long confinement.

In many cafes the violence inflicted is fo great, that the patient cannot move in the leaft for the purpofe of obeying the calls of nature, without being put to the moft excruciating and intolerable agony. Boyer fuccefsfully contrived, by means of a piece of girth web laid under the pelvis of one of his patients, and faftened to a pulley fixed at the top of the bed, to enable the poor fufferer to raife himfelf fufficiently from the furface of the bed to let a pan be put under him for the reception of the fæces. However, a bed made on the principles of the one lately recommended to the public by fir James Earle, would be the moft advantageous.

In certain examples abfceffes cannot be prevented from forming in the pelvis, notwithftanding the moft judicious treatment. Suppurations of this kind are particularly apt to arife when any detached fplinters of bone are driven inward.

It is poffible for the bladder to be wounded by a fharp fpicula of the fracture, and an extravafation of urine to be the confequence. Default met with a cafe of this defcription, where the piece of bone was taken out of a wound which was made to let out the effufed urine. Were fuch a cafe to prefent itfelf, the practitioner fhould keep a gum catheter conftantly introduced, in order to prevent any quantity of urine from collecting, and afterwards becoming diffufed.

Fractures of the Os Sacrum.

The os facrum cannot be broken without the operation of confiderable force. Hence the accident is not frequent, and, when it does happen, is generally occafioned by the fall of a very heavy body immediately againft the bone, the paffage of a cart or waggon over its convex fide, or by high falls on the part. The upper portion of a broken facrum obviouſly cannot be difplaced, by reafon of the firm manner in which it is connected with the lower lumbar vertebra. The lower piece is alfo feldom difplaced, becaufe there are no mufcles which tend to produce fuch an effect. The violence itfelf, however, may fometimes drive the inferior fragment inward, an event which is more likely to occur when the fracture is fituated low down towards the os coccygis.

As in the cafes which form the fubject of the foregoing fection, the chief part of the peril depends upon the injury which the pelvis and abdominal vifcera have fuftained, and the inflammation which they may undergo, fo, in the prefent inftances, the danger principally originates from the fame caufe, and the mifchief done to the feveral nerves.

From the fhort ftatement already made, it muft be evident that the indications in the treatment of a fractured facrum

crum are very much like those which present themselves in the foregoing species of fractures. The fractured surfaces being seldom separated and displaced, the injury of the bone commonly demands a very simple plan, which consists in applying a piece of the emplastrum saponis and a T bandage. If a case should occur in which the lower fragment is displaced, the reduction is to be accomplished in the way which will be explained in treating of fractures of the os coccygis.

The most alarming symptoms, and such as require the utmost surgical skill, are the inflammation which is apt to affect the viscera, the retention, or incontinence of urine, the involuntary discharge of the fæces, and the paralysis of the lower extremities, complaints which too frequently attend the accident, and bring on a fatal termination.

Upon this subject we need not here enlarge, as we have already delineated the proper plan of treatment in speaking of fractures of the other bones of the pelvis, and further information will be found in future articles. See INCONTINENCE *of Urine*, and RETENTION *of Urine*, *&c.*

Fractures of the Os Coccygis.

The os sacrum, although a bone of considerable strength, is more frequently broken than the os coccygis, which eludes the effect of external violence by its great degree of moveableness. Force operating, however, in a particular manner, may occasion a fracture, and one symptom of the accident is said to be an acute pain in the situation of the injured bone, when the patient walks, which exertion puts into action the fibres of the glutæi muscles arising from the part.

A fracture of the os coccygis may also be displaced by the lower fragment being driven inward. When this is the case, the practitioner should endeavour to replace the piece of bone, by means of his fore-finger introduced into the rectum, and the skilful assistance of the fingers of his other hand externally.

With regard to the treatment adapted for keeping the fracture in a steady and undisplaced condition, the practitioner can do little more than apply a piece of the emplastrum saponis and a T bandage, the patient being enjoined to avoid walking and making any pressure on the part.

Fractures of the Clavicle.

The situation, the slenderness, and the curved shape of the clavicle; the manner in which the bone is only supported at each end; the great efforts which it has to sustain when, in falling, the hands are brought forward; and several other anatomical and incidental considerations sufficiently obvious, afford a full explanation of the reason why fractures of the clavicle happen exceedingly often, and are much more common than its dislocations. The middle of the bone is more frequently broken than its other parts, and the fracture is almost always displaced, on account of the weight of the arm and the action of the pectoral muscle, the humeral portion of the bone falling under that which remains connected with the sternum. Encyclopédie Méthodique, Partie Chirurgicale, art. Clavicule.

A fracture of the clavicle is a case in which the diagnosis is remarkably easy; the accident, indeed, being obvious at first view, especially when the fragments are displaced, when there is no swelling, and when the patient is not exceedingly fat. The shoulder becomes depressed, approximated to the sternum, and so inclined towards the thorax, that there is no space betwixt them. It is only with difficulty that the arm can be raised, brought forward, or put to the side. When the fracture is simple, and its ends not considerably separated, the pain is sometimes moderate, or even trifling; but, upon the gentlest attempt being made to move the arm, the patient suffers great agony, which ceases immediately the fracture is replaced. When the fractured bone is not in its due situation, the humeral portion drawn down by the weight of the scapula, by that of the arm, and by the action of the deltoid muscle, becomes concealed under the sternal portion. The displaced condition of the bone is increased whenever the muscles act with violence, and the pain is aggravated by carrying forward the arm, or pressing it forcibly to the side.

It is not common for a fracture to occur at the scapulary end of the clavicle; but there is no doubt that a direct force, falling on the shoulder, may break any part of the bone. When the accident is thus produced, the soft parts may also suffer more or less contusion and laceration. The bone may be broken in more places than one, and the case receive the appellation of a comminuted fracture.

When the violence acts upon the extremities of the clavicle, as happens in falls on the outside of the shoulder and on the hands, while the arms are extended, the clavicle may be very much bent, and so obliquely broken, that the ends of the bone will protrude through the skin, and occasion what is termed a compound fracture.

Excessive violence applied to the shoulder may injure the cervical nerves, and has been known to bring on a paralysis of the arm, an affliction with which fractures of the clavicle may of course be sometimes complicated.

Although the records of surgery fully demonstrate that fractures of the clavicle have been, from the earliest periods, among the most common accidents to which mankind have always been subject, yet it is well known that the treatment of no other kind of fracture remained so long as that of the collar-bone in a state of imperfection and error. False notions and absurd practice descended regularly from one generation of surgeons to another, from the days of Hippocrates to those of Pott and Desault.

The following observations, taken from Desault's Parisian Chirurgical Journal, translated by Mr. Gosling, afford a good explanation of the opinions which have prevailed respecting the treatment of fractures of the clavicle.

"The attention of the Greek physicians was directed to the projection generally formed by the sternal fragment, which they conceived should always be depressed to the level of the humeral portion; and they endeavoured to accomplish this object by mechanical means; such as the application of lead, or thick compresses, retained on the clavicle by means of bandages. Such was the method employed, till the insufficiency and bad tendency of this practice were pointed out by Hippocrates, who, being more accurate and attentive in his observations than his predecessors, remarked that the projecting end of the sternal portion was in fact not more elevated, but that this appearance arose from the humeral portion being depressed, in consequence of being drawn down with the shoulder, and that consequently our endeavours should be directed to raise this portion on a level with the other. Such are the principles on which his doctrines and practice were founded; he recommends the arm to be brought to the side, and the shoulder to be elevated, so as to form an acute angle, and to be maintained in that situation by a proper bandage. This plan, according to our author, will tend to bring the ends of the bone in a state of apposition, and procure their reunion, at least it will effect this when the humeral portion is depressed below the sternal, which is generally the case. But this method will not always completely succeed; for instance, when the bones ride over each other, or when the

scapular

scapular portion is forced backwards. In these cases, Hippocrates recommends the patient to be laid on a hard body, (a plank, for instance,) and his shoulders to be drawn backwards with some degree of force, and maintained in this situation by a sort of spica bandage. If the scapular fragment should project forward, he recommends the elbow to be brought forward on the breast, and the palm of the hand to be applied against the opposite shoulder. And, with respect to the case, which very rarely occurs, of the scapular portion projecting above the sternal, he says nothing, as the weight of the shoulder is alone sufficient to bring it to its former situation.

"What Paulus Ægineta says on fractures of the clavicle seems to be a commentary on the text of Hippocrates; he makes his extension by carrying the arm upwards and outwards. In certain cases, he places a compress between the shoulders, whilst an assistant draws them backwards, and then applies a spica bandage; he also mentions, that the arm should not be supported, but left hanging to the side, when the humeral portion is more elevated than the sternal; in a word, his ideas and practice are precisely the same; the only circumstance in which he varies, is recommending a ball to be placed in the axilla, to make a more forcible extension, when the means recommended by Hippocrates are inadequate to the reduction.

"Albucasis, the author, who revived surgery among the Arabians, borrowed of Paulus Ægineta the idea of placing a ball in the axilla, and the use of the figure-of-8 bandage: he kept the shoulder constantly elevated, and supported the arm during the day in a sling, which he fixed, in the day, to the neck of the patient, and supported, at night, by placing a pillow under the axilla.

"Lanfranc and Gui de Chaubac have only transcribed what has been said by the above-mentioned authors: the last, instead of laying the patient on a thick pillow, attempts the reduction by applying the knee between the shoulders of the patient (agreeable to most modern practitioners, who have imitated this practice); and, if the depressed portion was not by this means sufficiently elevated, he recommended the application of an agglutinative plaster to produce this effect, a doctrine so absurd, that we are astonished to find it mentioned by some modern authors.

"Pecceti has gone farther than preceding writers, whose works he has attentively considered, and from whom he has frequently transcribed; for, he recommends the ball to be left in the axilla during the whole treatment, but still uses the figure-of-8 bandage.

"Subsequent writers have only commented on those authors we have recited; but, as the greatest part were not practitioners, they have omitted the explanation of one part of their doctrine, the most essential of all.

"The ball, which, with Paulus Ægineta, Avicennus, and Albucasis, was the principal means of reduction, has been viewed only by the moderns as merely a means to fill up the axilla, to prevent the parts being excoriated from the application of the bandage: but this is not the only error into which they have fallen, the fracture of the clavicle was invariably followed with more or less deformity, a remark generally made. Most surgeons, misled by a false theory respecting the union of fractures, conceived it was impossible to surround the clavicle by a bandage that would prevent the irregular shooting of the callus. Some, however, observed that the bandage of the ancients, then in use, did not prevent the motion of the fractured portions; but the means that they substituted and adopted on the same principles were not found to answer the intention.

"The iron cross of Heister and of the author of "La Chirurgie complette," the compress by which Mr. Petit kept the shoulders backwards, and other contrivances, are only different modifications of the figure-of-8 bandage; the inconveniences and insufficiency of which are demonstrated by every modern author; and, indeed, it is unnecessary to reason on the subject, as we find, from experience, it is absolutely inadequate to produce the effect we wish; and, indeed, in the opinion of all surgeons, no bandage has been yet contrived to retain the fractured parts sufficiently to prevent deformity and pain.

"Desault, firmly persuaded that a constant state of extension was absolutely necessary to keep the parts in a state of immobility and procure their re-union, invented, in 1768, a bandage that completely answered this indication, which some persons have conceived is to be found in Paulus Ægineta. This author certainly accomplished the reduction when it was difficult, by bringing the elbow on the breast, and separating, at the same time, the superior part of the arm, by means of a thick ball placed in the axilla; but, from his own account, we learn, that he did not keep up this means of extension during the whole treatment. He, indeed, adds, in a few lines, that after the reduction of the fracture, and applying thick compresses, a ball of wool should be placed in the axilla, and the bandage should pass under both axillæ, on the fractured clavicle, scapula, &c.

"After the application of this bandage, it is evident, that placing a ball of wool in the axilla was merely to furnish a point of support to the bandage, which, without this precaution, would have passed only over those parts where the muscles project. What further confirms this idea is, that the author employs no method to keep the arm close to the trunk; but rests satisfied with suspending it to the neck by means of a leather strap, and supporting the fore-arm in a sling, in the same way as after bleeding. Pecceti recommends the ball that was used in the reduction to be kept in the axilla; but still we do not see his direct indication, as he employs, like his predecessors, the bandage of the figure of 8, and says nothing of the manner of retaining the ball, nor of the necessity of keeping the arm close to the trunk."

Desault used to set a broken clavicle in the following manner. The patient was desired to stand, while an assistant elevated the arm sufficiently to make it perpendicular to the axis of the body. Desault next applied to the side of the breast a pad, made of old linen, as long as the humerus, in the form of a wedge, the width of which was from four to five inches; and the base, which was three inches thick, was placed in the axilla, and retained in that situation by means of a bandage five or six ells in length, and three fingers in breadth. One end was applied to the middle of the pad, and confined in that situation by two circular turns round the body, then passed before the breast above the right shoulder, then behind, and afterwards under; the roller was then brought horizontally before the breast on the pad, then obliquely upwards behind the breast, on the right shoulder, just forwards, and then under; then it was carried horizontally behind the breast on the pad, and continued in the same way till the whole bandage was expended.

The surgeon supported the pad in the axilla with one hand, and with the other elevated the elbow, so as to bring the scapular fragment of the clavicle in contact with the sternal portion, pressing the pad against the breast; making with the arm, by this method, a lever of the first species, by which means the arm was brought from the trunk, and the clavicle kept in a state of extension.

An assistant was desired to retain the arm in this situation with one hand, and with the other to support the fore-arm, bent

bent in a horizontal poſition; the palm of the hand applied to the anterior part of the breaſt. By this plan of treatment the bones were brought to their natural ſituation, and to ſuch an exact ſtate of appoſition, that no irregularity or deformity remained.

The arm was retained in this poſition by a bandage of ſix or ſeven ells in length, and four fingers in breadth; the end was applied before the right axilla, and brought horizontally before the breaſt, on the ſuperior part of the arm, behind the breaſt, and under the axilla: this firſt turn of the bandage was farther ſecured, by being twice paſſed in the ſame manner: the turns were then reflected over each other, and expanded on the breaſt and the reſt of the arm; and, as it approached near the elbow, the bandage was drawn tighter, and paſſed in circular turns round the fore-arm, and pinned to that part.

The corners of the pad were pinned to the upper part of the bandage, and the hand received an additional ſupport by the middle of a compreſs, the ends of which were pinned to the anterior part of the bandage; the vacuities above and below the clavicle were filled with lint; and the fractured portions covered with compreſſes, dipt in aq. veg. which were doubled, and ſeven or eight inches in length, and three wide.

Under the right axilla, the end of a bandage, ſeven or eight ells in length, and three fingers wide, was applied, and paſſed obliquely above the breaſt, on the compreſſes which covered the clavicle, behind the ſhoulder and the arm, under the elbow, (which the aſſiſtant ſtill continued to ſupport,) then obliquely upwards before the breaſt, and under the right axilla. Over the firſt turn of the bandage it was paſſed three times preciſely in the ſame way, and the remainder of the bandage, brought from behind forwards under the right axilla, was expended in circular turns, paſſed from the right to the left on the arm, and round the breaſt, to fix the firſt part of the bandage, and to carry back the arm that correſponded with the fractured clavicle: particular attention was paid to prevent the bandage getting looſe, by ſecuring it in different parts by means of pins. See Pariſian Surgical Journal, vol. i.

Default's bandage is ſimple, although ſome attention will be neceſſary in applying it. Its mode of acting is obvious. The cuſhion or compreſs, which acts as a ſupport to the internal ſurface of the arm, is ſhaped in ſuch a manner, that at the time the elbow is brought cloſe to the breaſt, the ſuperior part of the arm is ſeparated ſome diſtance from the body. The arm, carried outwards, drags the ſhoulder at the ſame time, and with it the ſcapular portion of the fractured clavicle, which would have been carried inwards by the pectoral muſcles, the ſeratus major anticus, and the ſubclavius, if their action had not been oppoſed by the thickneſs of the ſuperior part of the cuſhion. The circular turns of the bandage, which fix the arm againſt the breaſt, have the double advantage of keeping up the extenſion, and preventing at the ſame time the motions of the arm and ſhoulder, and, conſequently, retaining the portions of the fractured bone in a conſtant ſtate of appoſition. The elevation of the arm tends to place the humeral portion of the clavicle on a level with the ſternal; and the turns of the bandage, paſſing at one part under the elbow and fore-arm, and at another part on the fragment that is moſt elevated, which it depreſſes, and raiſes the other, bringing their ſurfaces oppoſed to each other. This bandage ſerves to confine the actions of the trapezius and ſterno-maſtoideus, which are attached to this bone. With reſpect to the ordinary time for the conſolidation of the fracture, Hippocrates fixes it from fourteen to twenty days; Albucaſis, from twenty to twenty-four or twenty-eight; and this calculation agrees nearly with the reſult of Deſault's experience. Pariſian Chirurgical Journal.

Notwithſtanding the excellency of the foregoing plan, Engliſh ſurgeons are not much in the habit of following it, perhaps on account of its being a little more complicated than the method of confining the ſhoulders back with a figure-of-eight-bandage, and ſupporting the arm in a ſling, as is their uſual mode. The obvious imperfection of the figure-of-eight bandage is, that it tends to depreſs the ſcapulary end of the clavicle, at the ſame time that it draws it backward. We need ſcarcely remark, that when ſuch bandage is uſed, the margins of the axillæ muſt be defended with tow, and that it is cuſtomary to put a piece of the emplaſtrum ſaponis on the ſkin covering the fracture.

Fractures of the Scapula.

The ſituation of the ſcapula, and the quantity of muſcle upon it, render the body of this bone not very liable to be broken; but the accident does every now and then take place. Particular parts of the ſcapula, however, are frequently fractured; as, for inſtance, the acromion, the inferior angle, the neck, and the coracoid proceſs.

When the acromion is broken, the weight of the arm, and the contraction of the deltoid muſcle, draw the detached piece downward, while the trapezius and levator ſcapulæ draw the reſt of the bone upward and backward.

When the lower angle of the ſcapula is broken, it is drawn forward by the action of the ſerratus major anticus, the reſt of the bone remaining in its natural ſituation. If the portion of the angle fractured off be conſiderable, it may alſo be pulled upward and forward by the teres major, and ſome fibres of the latiſſimus dorſi.

In fractures of the coracoid proceſs, this part is ſeparated from the reſt of the ſcapula, in conſequence of being drawn downward and forward by the action of the coraco-brachialis and ſhort head of the biceps.

Fractures of the neck of the ſcapula are followed by a falling down of the ſhoulder, occaſioned by the weight of the arm. The appearance of the limb is like that of a diſlocation; but the difference of the caſe is eaſily diſtinguiſhed by the facility with which the os brachii may be puſhed up to its proper height, the perception of a crepitus, and the falling down of the limb again, as ſoon as it is left unſupported.

It frequently happens, that after a fall, or blow on the ſhoulder or arm, when the clavicle and ſcapula cannot be diſcovered to be any where broken, a great deal of pain, and a manifeſt crepitus occur on moving the ſhoulder-joint. It is probable that, in ſome caſes of this kind, a ſmall portion of the head of the os brachii, or a little piece of the glenoid cavity of the ſcapula, may be broken off.

The ſymptoms of a fractured acromion are, pain in the ſituation of the injury, a change in the external appearance and ſhape of the ſhoulder, and a falling downward of the detached portion of the bone, which may be raiſed into its proper poſition by bringing up the elbow cloſe to the ſide.

Fractures of the inferior angle are very obvious and eaſy of detection, by reaſon of the great ſeparation which takes place between the fragment and main part of the bone. The detached piece, alſo, does not move with the reſt of the ſcapula.

Fractures of the ſpine of the ſcapula are rendered manifeſt by

by the irregularity which is generally produced in the courfe of that prominent procefs. A crepitus is likewife perceptible.

When the body of the fcapula is fractured, the nature of the accident is ufually made fufficiently plain by the crepitus which takes place on moving the fhoulder and arm.

Fractures of the body of the fcapula are fometimes comminuted; but, as the fragments are covered with mufcles on both fides, they are hardly ever difplaced.

The treatment of fractures of the fcapula prefents the fame indications which accompany fractures in general. In longitudinal and tranfverfe fractures of the body of the bone the furgeon has very little to do: a piece of the emplaftrum faponis and fome compreffes fhould be laid over the fituation of the injured part, and be kept on with a fpica bandage. The chief indication, however, is to maintain the broken bone in a motionlefs ftate; an object which can only be accomplifhed, by preventing the arm itfelf from moving. Hence, it becomes neceffary to confine the humerus clofe to the fide, by applying a roller round it and the body together, from the fhoulder to the elbow.

We have remarked, that when the lower angle of the fcapula is broken, the fragment becomes drawn downward and forward by the action of the ferratus major anticus mufcle. Hence, it is proper to bring the fcapula towards the feparated fragment, by bringing the arm itfelf downward and forward, in which fituation it fhould be confined with a roller. The fore-arm fhould alfo be fupported in a fling, and the fragment of bone be kept as much upward and backward as poffible, by means of proper compreffes and a bandage.

When the acromion is fractured, the action of the deltoid mufcle tends to draw downward and outward the detached portion. The treatment confifts in raifing the arm fufficiently to make the head of the os brachii force the outer part of the acromion upward, at the fame time that an affiftant pufhes the fcapula downward and forward, in the oppofite direction to that in which the furgeon pufhes the arm. In this country, practitioners ufually apply a piece of the emplaftrum faponis to the fituation of the fracture, and then the fpica bandage. But thefe latter proceedings are only for the fake of appearances, and tend to no particular good. The grand object fhould be to maintain the fhoulder and arm in the pofition above defcribed; and it may be effected by applying a roller round the arm and trunk together, and putting compreffes and a bandage on the fcapula.

There is an advantage, alfo, in making the head of the os brachii ftand more out, on bringing the elbow clofe to the fide; and it was with this view that Default was in the habit of placing a fmall pillow in the arm-pit, before he bound the arm and body together with the roller.

The treatment of fractures of the coracoid procefs confifts in bringing the os brachii forward towards the fternum, and placing the fhoulder downward and forward, fo as to relax the mufcles which have the power of difplacing the fragment. The arm fhould be kept in the pofition which we have fpecified, by means of a fling. A roller may be ufed for keeping the fhoulder downward and forward, and fome ufe may be derived from placing a comprefs juft under the detached piece of bone.

When the neck of the fcapula is fractured, the glenoid cavity and the whole of the upper extremity fall fo much downward as to occafion the appearance of a diflocation. The plan which the furgeon ought obvioufly to follow in this cafe, is to raife the os brachii fufficiently to bring the external piece of the neck of the fcapula into contact with the internal one. The limb and glenoid cavity fhould then be prevented from falling down again by fupporting the elbow and fore-arm in a proper fling. A piece of the emplaftrum faponis and a fpica bandage are next applied by the generality of practitioners. But a more ufeful ftep is to prevent all motion of the fhoulder and arm, by binding the os brachii clofe to the fide with a roller. Thus the fracture will be kept in a quiet ftate, which is highly favourable to the union of all broken bones.

Fractures of the Humerus, or Os Brachii.

It is remarked by furgical writers that fractures of the humerus are very feldom difplaced in the longitudinal direction, efpecially when the folution of continuity is fituated at the lower part of the bone. Here the brachialis internus and triceps mufcles, being attached to the humerus on all fides, prevent both the fragments from becoming feparated. Circumftances are different when the fracture happens above the infertions of the deltoid and coraco-brachialis mufcles. If we confider the action of thefe mufcles, and the manner in which the latiffimus dorfi, pectoralis major, and other mufcles exert themfelves, we fhall difcover in fuch powers many caufes to difplace the fracture, particularly when it is an oblique one, as is often the cafe.

All oblique fractures of the os brachii are generally difplaced, whenever the part of the bone in which the folution of continuity has happened is above the middle. The upper furface of the fracture being then unfitted for making an effectual mechanical refiftance to the afcent of the lower one, the latter eafily glides upward and rides over the former, on being drawn in fuch direction by the action of the deltoid, biceps, coraco-brachialis, and long portion of the triceps.

The humerus is fubject to fractures at every part, from the head to the condyles of the bone. When the folution of continuity happens above the infertion of the pectoralis major, latiffimus dorfi, and teres major mufcles, furgeons call it a fracture of the neck of the humerus, an expreffion which does not ftrictly accord with the idea which anatomifts give us, of what ought properly to be regarded as that part of the bone. The neck, in anatomical language, means the circular contraction which feparates the head from the tuberofities; but feveral eminent writers on furgery imply by a fracture of the neck of the humerus any folution of continuity above the infertion of thofe particular mufcles which we have juft been enumerating.

The general fymptoms attendant on fractures of the humerus are, a change in the direction, and a fhortening of the limb; a diftinct crepitus on moving the lower portion of the broken bone; confiderable pain, which is materially increafed by every movement of the arm; the ufe of the limb is loft, &c. The reader is already apprifed that when the fracture is fituated low down, its ends will not ride over each other fo as to fhorten the member.

The diagnofis of moft fractures of the os brachii is fufficiently plain: it is only when the neck of the bone is broken that any obfcurity is likely to prevail, and that there is any probability of miftaking the cafe for a luxation of the fhoulder. A little reflection will foon qualify any practitioner to avoid the error; for the differences of the two cafes are confiderable.

Fractures of the neck of the humerus are attended with a depreffion at the upper and outer part of the arm.

When the head of the bone is diflocated into the axilla, a deep hollow may be felt immediately under the acromion, in the

the place which the head of the bone ought to occupy. The ſhoulder is not ſo prominent as natural, and the acromion ſeems to form a preternatural projection. The limb is alſo lengthened.

On the contrary, when the neck of the bone is fractured there is no alteration in the ſhape of the ſhoulder; the acromion does not appear to make any uncommon projection; there is no unuſual hollow immediately under it, and whatever depreſſion occurs, is ſituated lower down.

The limb, inſtead of being lengthened, is ſhortened; in the axilla, inſtead of the round, ſmooth head of the bone, the rough end of the lower fragment may ſometimes be felt; and added to all theſe circumſtances, there is that almoſt deciſive ſymptom, a crepitus.

Before proceeding to ſpeak of the treatment of fractures of the humerus, we ſhall make a few remarks on ſuch injuries, when they affect the lower end of the bone.

The inferior end of the os brachii is ſometimes fractured in ſuch a way, that a longitudinal ſolution of continuity divides the two condyles from each other, and, extending more or leſs upward, is bounded by another tranſverſe or oblique diviſion, which affects the whole thickneſs of the bone. Hence, there are three different pieces of bone, and two fractures.

In certain inſtances, fractures of the lower end of the os brachii are of a more ſimple deſcription; for the diviſion may be oblique, and run down in the direction outward, or inward, ſo as to extend acroſs one ſide of the lower end of the bone, and reach into the joint, thereby detaching only one of the condyles from the body of the bone. It is alſo poſſible for the internal condyle to be broken, without the fracture having any communication whatſoever with the cavity of the joint.

When the bone is ſo broken, as to be ſplit into three portions, with a ſeparation of both condyles, the deformity is greater, and the fractured part more moveable than in the other example. On making preſſure either on the front or back part of the joint, the two condyles become more diſtant from each other, and the injured part of the arm ſeems widened. The patient commonly keeps his fore-arm in a ſtate of pronation; and the practitioner, on taking hold of both condyles at once, and moving them in contrary directions, may feel a manifeſt crepitus.

When only one condyle is detached, the ſurgeon may alſo feel a grating on moving the ſeparated fragment; but the deformity is much leſs conſiderable.

In ordinary fractures of the humerus, the firſt duty of the ſurgeon is to put the ends of the broken bone into as even a poſition with regard to each other as circumſtances will allow. However, when the ſolution of continuity is tranſverſe and ſituated low down, the reader already knows that it often happens that the fragments are little if at all diſplaced.

It was once the cuſtom to place the arm at a right angle with the body; but this method, being found diſadvantageous, it was abandoned; and modern practitioners now univerſally give the preference to that poſition in which the arm lies in the direction of the trunk. Such poſture is found to be leſs irkſome to the patient, and the ends of the fracture are leſs apt to be diſturbed, ſince there is no occaſion to move the limb out of that poſition during the whole of the treatment.

It is cuſtomary, alſo, to adviſe the patient to go to bed, and to remain there for the firſt few days. As ſoon as the patient is in bed, no time is to be loſt before the ſurgeon ſets about reducing and putting up the fracture.

Abroad, ſurgeons direct one aſſiſtant to take hold of the wriſt and make the requiſite degree of extenſion, while another graſps the upper part of the os brachii, and the practitioner himſelf endeavours with his fingers to make the ends of the fracture lie as ſmoothly and evenly as poſſible. In this country we are in the habit of acting ſomewhat differently; for we bend the elbow-joint in the firſt inſtance, and apply our extenſion and counter-extenſion immediately to the lower and upper portions of the broken bone.

We muſt alſo remark that fractures of the humerus ſeldom require a violent degree of extenſion.

The fracture having been reduced and put into an even ſtate of coaptation, the next indication is to keep it quietly in ſuch condition, until a firm union of one portion of the bone to the other has taken place.

The means employed for this purpoſe are, a piece of the emplaſtrum ſaponis, a roller, ſplints well lined with ſoft pads, and a ſling for the ſupport of the fore-arm and hand.

The integuments in the vicinity of the fracture have commonly applied to them two pieces of the ſoap-plaſter, which together ought to extend all round the limb. This method is preferable to ſurrounding the part with one larger piece, which, in caſe of much ſwelling taking place, might not yield ſufficiently to prevent the unpleaſant conſequences likely to ariſe from any undue preſſure on, and confinement of, the member in this circumſtance.

The roller is next to be applied from the elbow up to the armpit, in the common way, the practitioner taking care not to make the bandage too tight; a thing which could do no good, and might be productive of pain and other bad effects.

It is plain that the preceding parts of the apparatus are more uſed for the ſake of neatneſs and appearances than for any particular efficacy. The moſt uſeful means are the ſplints and ſling.

Four ſplints are uſually employed; *viz.* one on the inſide; one on the outſide; one on the back; and another on the fore-part of the arm. The external one ſhould reach from the acromion to the outer condyle; the inner one, from the margins of the axilla to the internal condyle; the back one, from the head of the bone down to the olecranon; and the anterior one, from the ſame height down to the bend of the elbow. The bad conſequences of their preſſure on the ſoft parts are to be prevented, by placing betwixt the ſkin, and the inſide of the inſtruments, pads made of tow, or wool. Compreſſes ought alſo to be uſed for hindering the ends of the ſplints from chafing the margins of the axilla, or any other place where the patient feels uneaſineſs from a ſimilar cauſe.

Splints made with longitudinal joints, and lined with leather, are very good ones for fractures of the humerus. When the inſtruments are too long, and none of the proper ſhortneſs are at hand, the ſurgeon commonly cuts off as much of each ſplint which he ſelects as is neceſſary.

The ſplints being all arranged in their reſpective places, the practitioner maintains them ſo with three or four bits of tape, doubled into as many nooſes, applied at different parts of the limb, and tied in bows.

Many ſurgeons act very properly in not truſting entirely to tapes, which are apt to become ſlack after a little while, ſo as to allow the ſplints to ſlip and move about. Such practitioners, with great prudence, apply a roller over the ſplints, and then the tapes, if they are required.

As all motion of the elbow-joint, and of the radius, would produce a diſturbance of the fracture, it is neceſſary to lay the fore-arm in a ſling, and keep it perfectly at reſt. The ſling ſhould not preſs the elbow too forcibly upward, which,

 in

in cases of oblique fractures, would be apt to make the lower piece of the broken bone ascend and ride over the low one.

We shall now introduce a few observations on the treatment of fractures of the neck of the humerus.

Sometimes fractures of the neck of the humerus are not at all displaced, and the diagnosis is consequently very difficult. However, in the generality of cases, the lower end of the fracture is drawn out of its proper position, while the upper one continues quite undisplaced, being of little extent, and acted upon by few muscles.

In ordinary instances, the lower fragment is not materially displaced in the longitudinal direction; though cases do occur, in which the bone is considerably out of its right situation in this respect. This happens when the fracture is exceedingly oblique, and the muscles contract with unusual violence, and also when the force, which breaks the bone, continues to operate after the fracture, so as to separate the ends of the bone from each other. In "Les Oeuvres Chirurgicales de Default," it is said, that in this manner the inferior end of the fracture has been driven through the deltoid muscle and skin of the shoulder. According to Petit, the action of the muscles is in general effectually resisted by the weight of the limb, and the fracture is only displaced in the transverse direction, inward or outward. In the first case, which is the least frequent, the elbow is separated from the trunk, and cannot be put near to it without pain. In the second case the elbow inclines towards the side.

Default advises the reduction to be made as follows: one assistant is to fix the trunk, by drawing towards himself the opposite arm. A second assistant is to take hold of the fore-arm, in a state of half-flexion, placing one of his hands behind the wrist to serve as a fulcrum, while the other is applied to the middle of the front of the fore-arm for the purpose of pressing it downward, so as to make the requisite extension.

In this way the reduction may be accomplished with very little force, directed according as the lower fragment is displaced inward or outward.

The indications in the treatment of fractures of the head or neck of the humerus are, to make the arm and shoulder immoveable; to bring either outward or inward the lower end of the fracture, and to draw downward the same. These are the objects which every bandage ought to fulfil; but it should be understood, that the last purpose is of the least importance, because, in general, the weight of the arm is alone sufficient to counteract such muscles as have a tendency to draw the lower end of the fracture upward.

The following was the apparatus, which the celebrated French surgeon, Default, was in the habit of employing with success for the cure of fractures of the above description.

1. Two bandages, one about five or six ells long, the other eight or ten, both being about three finger-breadths wide. 2. Three strong splints, of different lengths, and two finger-breadths broad. 3. A linen pillow, three or four inches thick at one of its ends, terminating at the other in a narrow point, and long enough to reach from the axilla to the elbow. 4. A sling to support the fore-arm. 5. A towel to cover the whole of the apparatus.

The reduction is to be effected as above explained, and the assistants are to continue the extension. Then the surgeon is to take the first roller, which is to be wet with the aq. veg. min. and is to fix one of its heads by applying two circular turns to the upper part of the fore-arm. The bandage is now to be rolled moderately tight round the arm upward, making each turn overlap two-thirds of that which is immediately below it. When the roller has reached the upper part of the limb, it must be doubled back a few times to prevent the folds which the inequality of the part would create. The bandage is afterwards to be carried twice under the opposite axilla, and the rest of it, rolled up, is to be brought up to the top of the shoulder, and committed to the care of an assistant.

The first splint is to be placed in front, reaching from the bend of the arm as high as the acromion. The second, on the outside from the external condyle to the same height. The third, behind, from the olecranon to the margin of the axilla. The pillow interposed between the arm and thorax serves as a fourth splint, which becomes useless. An assistant applies these parts of the apparatus, and holds them on by applying his hands near the bend of the arm, in order not to obstruct the application of the remainder of the bandage.

The surgeon takes hold of the bandage again, and applies it over the splints with moderate tightness, and the bandage ends at the upper part of the fore-arm, where it began.

The assistants continually keeping up the extension, the surgeon is to place the pillow between the arm and trunk, taking care to put the thick end upward, if the fracture be displaced inward; but downward, if this should be displaced outward, which is most common. It is to be attached by two pins to the upper part of the roller.

The arm is to be brought near the trunk, and fixed upon the pillow, by means of the second roller, applied round the arm and thorax. The turns of this bandage should be very tight below, and rather slack above, if the fracture should be displaced inward: but, if outward, they should be slack below and tight above.

The fore-arm is to be supported in a sling, and the whole of the apparatus is to be covered with a napkin, which will prevent the bandages from being displaced.

Fractures of the lower end of the os brachii were regarded by Paré, Petit, Heister, Duverney, and several other surgical authors, as very apt to be attended with alarming consequences, large abscesses, gangrenous mischief, caries, anchylosis, &c.

The experience of Default affords ample proof, that the foregoing evils are not so likely to happen, as former surgeons believed, at least under judicious treatment.

We know, that every fracture near a joint is not invariably dangerous, nor productive of permanent inconveniences. The result of fractures of the patella and olecranon, cases which are particularly common, ought to inform us, that, though fractures near joints, sometimes, have a disagreeable termination, they frequently end in a very favourable manner. Compound fractures of any large joints, however, may be justly looked upon as cases of the most dangerous description; they often require the performance of amputation immediately after the accident.

When the lower end of the os brachii is fractured, the detached condyle, or condyles, are sometimes displaced; but, in general, the separation is not considerable, owing to the fragments being drawn in opposite directions by the muscles of the arm and fore-arm, which powers counteract each other. Whenever the separation is wide, it is the direct of the external violence.

The condyles may be displaced forward, or backward, or they may recede from each other sideways.

From this account it is plain, that the object of the apparatus should be to prevent the fragments from being displaced in these four directions.

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The fracture having been reduced, and some of the emplastrum saponis applied, a roller should be put round the part, and then round the fore-arm, in order to make gentle compression on the muscles inserted into the condyles. Such pressure, Desault believed, diminished the power of the muscles in acting upon, and displacing the parts. The same distinguished surgeon next advises the application of four splints, one in front of, one behind, and two others to the sides of the arm. He thought that there was no utility in having the splints to extend very high up the arm, in this particular case. The anterior and posterior splints he recommends to be made flexible at their middle part, which is to be put opposite the elbow-joint, so as to allow it to be in a state of flexion, at the same time that they reach for a certain extent down the fore-arm.

We need scarcely remark, that the fore-arm must also be kept at rest in a sling.

Fractures of the Olecranon.

The ancients have not left us any remarks of importance concerning fractures of the olecranon, and several modern writers appear to have been very imperfectly acquainted with the subject.

Putting out of consideration pronation and supination, which have little connection with the present cases, we may observe that the elbow is a joint admitting of flexion and extension, for which purposes, the rounded and pulley-like extremity of the os humeri is received, and moves in a corresponding cavity of the ulna, called *sigmoid*. The two processes, by which this cavity is in some degree formed, are its anterior, called *coronoid*, and its posterior, called *olecrânon*. In order the better to regulate the degree of flexion and extension, there are two cavities, situated at the inferior extremity of the os humeri; one on the anterior, the other on the posterior surface; into these the two processes of the ulna are occasionally received. When the joint is in the greatest degree of flexion, the coronoid process is received into the anterior cavity; and, when in the greatest degree of extension, the extremity of the olecranon occupies the posterior cavity.

In order to communicate motion to this arrangement of parts, muscles are situated in various directions; but the muscle, by which extension is chiefly performed, the triceps extensor cubiti, being inserted into the extremity of the olecranon, has an attachment peculiarly advantageous and mechanical, as it is thereby at some distance from the centre of motion, consequently, less exertion will be necessary to accomplish extension.

When by any accident the olecranon is broken off, two very important changes are induced. First, the lever, which enabled the muscle to act so advantageously, is removed. Secondly, the space, in which the muscle acted, is now shortened. Hence, that bony arrangement, that was before so favourable to motion, is now destroyed; and the muscle, by whose agency such motion was performed, has its power considerably lessened. See some remarks by Haighton in the ninth volume of the Medical Commentaries, p. 382.

Fractures may occur either at the base, or the extremity of the olecranon. The first kind of case is the most common. The solution of continuity is sometimes oblique, though, generally, transverse. The accident is usually occasioned by external violence; but, in certain instances, the process is torn off by the violent action of the powerful muscle, which is attached to it.

The following description of the symptoms of this fracture will enable any practitioner to detect what has happened with equal ease and certainty. The contraction of the triceps, being no longer resisted by any connection with the main portion of the ulna, this muscle pulls upward the small piece of bone broken off, so as to produce an interspace between such fragment and the rest of the bone. The interspace is situated at the back part of the joint, and may be increased, or diminished, by simply augmenting the bent, or extended state of the fore-arm. The patient cannot spontaneously extend his fore-arm, owing to the connection of the triceps with the ulna being destroyed. Whether the anconæus alone may be adequate to accomplish this motion in certain examples, we will not take upon us to decide; but, certain it is, the fore-arm is always found in a half-bent state, in consequence of the flexor muscles not having any considerable antagonist. The detached portion of the olecranon becomes drawn higher up than the condyles of the os humeri; whereas, in the natural state, the latter processes are situated higher than the point of the olecranon, when the fore-arm is in a state of half-flexion. The fragment of bone may be moved in any direction, without any motion being imparted to the ulna. When the fore-arm is extended, and the surgeon pushes down the retracted piece of bone, a grating or crepitus generally admits of being felt.

We may also remark, that this accident, like most other fractures, is attended with a good deal of pain, and the soft parts soon become affected with considerable swelling.

In the Parisian Chirurgical Journal, vol. i. are some observations on the Treatment of the Fractures of the Olecranon: some of these we shall take the liberty of introducing into this work.

The ancients have transmitted to us nothing on fractures of the olecranon, unless we admit that Paulus Eginetus has made allusion to them in the following passage: "Cubitus frangitur—circa partem ad cubiti gibbum." (De Re Medicâ, lib. 6. cap. 100.) The moderns, and even Petit himself, have not distinguished this from other fractures of the ulna. The majority of practitioners, misled by a false theory, and persuaded that loss of motion was necessarily consequent to all fractures, connected with the articulations, did not even attempt its reduction. They kept the arm in a sling in a flex position, in order that the anchylosis might be as little inconvenient as possible. And what tended to confirm them in their error was, that the powers of extension were totally lost by the observance of the extended position, and in consequence of the muscles remaining for such a length of time in a state of inaction.

Duverney is the first who has proposed a methodical treatment for this accident. (Mal. des Os. tom. i. p. 325.) This fracture, he says, is to be distinguished by the circumstance of the fractured portion being drawn up by the actions of the extensor muscles, and the impossibility of moving the fore-arm, which rests hanging by the side of the body. He accomplishes the reduction by extending the fore-arm, pushing down the process of the olecranon with his thumbs, and retaining it in this situation by means of a thick narrow compress placed above the fracture. A circular compress, and a bandage like that used in bleeding, are then applied over the former application. The limb, slightly bent, was next laid on a pillow; and, at the expiration of a few days, an endeavour was made to prevent an anchylosis by gentle and repeated motion.

M. David attributes the anchylosis, which often followed fractures of the olecranon, to the ignorance of the surgeon. Rest and extension, he thinks, essentially necessary to the reunion; but as soon as this has taken place, which is generally about the twenty-fifth day, he recommends the arm to be gently moved, and this motion to be increased every day.

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He obferves, alfo, that if the arm be extended too much, the extremity of the ulna will be forced in, and the union will either be imperfect, or the motions of the joint attended with difficulty. Differt. fur les Effets du Mouvement, &c. p. 63, &c.

It is ftated in the Parifian Chirurgical Journal, that, before the time of its publication, the fubject of fractures of the olecranon had not been duly confidered. Duverney's method was fubject to many inconveniences: his compreffes, bandages, &c. could eafily be difplaced; and he applied nothing to prevent the flexion of the fore-arm. When the bandage was too loofe, the olecranon could not be retained in its fituation; and when it was too tight, much fwelling was induced.

The following was Default's plan, which does not materially differ from the mode followed in this country, and appears to us judicious and deferving of imitation.

While the affiftants extend the fore-arm, one turn of a fingle-headed roller, moiftened with the faturnine lotion, is to be applied round the wrift, and continued over the whole fore-arm as high as the bend of the elbow. The fractured olecranon is to be drawn down towards the ulna, while the fkin is pulled upward by an affiftant, fo as to prevent it from being wrinkled. When this caution is overlooked, fome folds of the integuments are apt to get between the difunited parts, and prove an impediment to the re-union. When the finger is removed, which is employed for preffing the olecranon againft the ulna, the fragment of bone is to be kept in its proper fituation by a turn of the roller, which is to be carried from the upper and front part of the fore-arm above the elbow, and then on the infide of the limb. The roller is now to be reflected back again on the anterior part of the fore-arm, fo as to make a bandage in the fhape of a figure of eight, fimilar to what is ufed after bleeding. The application of the roller is to be continued as high as the upper part of the arm, where it is to be fixed by a circular turn.

A ftrong fplint is next applied to the whole length of the arm and fore-arm. The inftrument is to be a little bent at the joint, in order to prevent the complete extenfion of the fore-arm; by which means, according to Default, the end of the fractured ulna would be forced into the cavity of the olecranon, and pufhed more forward than the other fragment, fo as to render the union irregular.

The fplint is to be retained with the reft of the roller, and the limb laid on a pillow, in fuch a way that the preffure may be every where equal.

When the bandage grows flack, in confequence of the fubfidence of the fwelling, it is to be taken off and reapplied.

At the end of three weeks, the fplint may be left off, and a roller alone ufed for keeping the limb extended a few days longer. All bandages may now be omitted, and the furgeon fhould accuftom the patient to bend and extend the joint for a certain time every day.

We have never feen any ill effects arife from keeping the fore-arm quite extended; but, fhould it be deemed proper to keep the limb a little bent, and fhould no fplint like that recommended by Default be at hand, the furgeon might make a ftraight one anfwer the purpofe, by filling up the fpace under the middle of the fplint, in front of the elbow-joint, with a proper-fhaped pad, made with tow, or any other foft material.

It fometimes happens, that one of the bones of the fore-arm is broken, together with the olecranon; and, as it is ufual to bend the limb in the treatment of the firft injury, and extend the arm for the cure of the fecond, the practitioner may be thrown into embarraffment by meeting with a cafe of this defcription.

The matter, however, is very fimple. Bending the arm is not effential for the cure of fractures of the radius or ulna, but is abfolutely requifite for uniting the broken olecranon, fo as to prevent future lamenefs. Hence, the proper method is to keep the limb in a ftraight pofition, and pay attention to both accidents. We have, in this manner, cured a cafe of fractured olecranon and radius with the utmoft fuccefs. It fhould alfo be noticed, that this practice was what the eminent Default was in the habit of following, and advifing in his lectures.

Fractures of the Fore-arm.

The fore-arm is particularly often the fituation of fractures; and this circumftance is afcribable both to the way in which the radius and ulna are expofed to direct external violence, and to the manner in which every force applied to the hand is tranfmitted to the former of thefe bones. Hence it happens, that fractures of the radius are much more frequent than thofe of the ulna; but the conjoined number of thefe accidents, with regard to the two bones, appears, from a comparative table kept at the Hôtel-Dieu, in the time of Default, to equal, or rather exceed, the number of fractures affecting any other part of the body.

In fome inftances, we find both the bones of the fore-arm broken together; while, on other occafions, only one bone is injured.

Fractures of both Bones of the Fore-arm.

The accident may take place near the elbow, or wrift, or at the central part of the limb. The latter fituation is that in which fractures happen moft frequently; they alfo often occur towards the wrift, but feldom near the bend of the arm. In this laft fituation, the thicknefs and ftrength of the ulna, and the manner in which the bones are covered and protected by numerous mufcles, neceffarily render the accident uncommon. We do not wifh, however, to make the reader imagine that the upper part of the fore-arm is totally out of the danger of fractures. It has, indeed, never been our lot to meet with an example, in which the radius and ulna have been broken together, in this high fituation; but there can be no doubt that fuch an accident is poffible, and might arife from the paffage of the wheel of a cart or carriage over the limb. We have, in two or three inftances, feen the upper end of the radius broken off.

When both the bones of the fore-arm are fractured, the folution of continuity generally runs in the fame line. However, this is not invariably the cafe.

It does not often happen that fractures of this part of the body are either compound or comminuted. Both kinds of cafes may prefent themfelves in a large field of practice; but furgeons of circumfcribed experience are not very likely to meet with them. Default had under his care a patient, whofe radius and ulna were both broken in two places, by the paffage of a cart-wheel over the limb: the deformity remaining after the cure was exceedingly trivial.

A fracture of both bones of the fore-arm is generally occafioned by fuch a force as operates directly on the broken part. The accident hardly ever originates from a fall on the hand; in which occurrence, the external violence generally only affects the radius, which alone becomes fractured.

Fractures of the radius and ulna together are very eafily diftinguifhed. The furgeon finds the limb capable of being bent at a part, which was previoufly firm, ftraight, and unyielding.

unyielding. On taking hold of the limb, he readily feels a crepitus, or grating of the ends of the fracture. In certain cases, there is a manifest depression where the solution of continuity has happened; in other instances, a prominence formed by the extremities of the fracture. Handling and moving the injured part excite a severe degree of pain. The patient is unable to execute the pronation and supination of the hand, and is almost always found with his elbow-joint half bent.

A mistake may indeed be made, when both bones are fractured very near the wrist; in which sort of case, the practitioner may erroneously conclude that there is a dislocation. The way to avoid forming a wrong judgment is to pay attention to the situation of the styloid processes, in relation to the deformity. When they are above it, and remain motionless on moving the carpus, the case is a dislocation; when they are below the deformed part, and move about with the hand and wrist, the accident is a fracture. In the latter instance, also, a crepitus may generally be felt, and the injured part is more moveable than in the example of a luxation.

The deformity attendant on fractures of both bones of the fore-arm can never take place, in any very considerable degree, in the longitudinal direction. The manner in which the interosseous ligament is connected with the four ends of the fracture, forms an impediment to any material shortening of the fore-arm. A transverse kind of deformity is apt to occur, which arises from the ends of the broken bones inclining towards the centre of the limb, so as to lessen the breadth of, what might be called, the interosseous space.

What the French surgeons name an angular deformity is also produced, either forward or backward, according to the direction of the force which occasioned the fracture.

The treatment of a fracture of both bones of the fore-arm is to be conducted in the following manner: The surgeon is, in the first place, to bend the fore-arm to a right angle with the arm, and put the hand in the middle state between pronation and supination. An assistant is now to take hold of the patient's four fingers, and make the necessary degree of extension; while another assistant makes the requisite counter-extension, by fixing the lower part of the os brachii with both his hands. The surgeon should now endeavour to put the ends of the fracture in an even state of coaptation; and, above all things, he should try to restore the due width of the interosseous space, by gently pressing the soft parts into it.

We have to remark on this subject, that fractures of the fore-arm may generally be set with great facility, and without the exertion of much force in the extension.

English practitioners, as soon as they have reduced the fracture, next put a piece of soap-plaster round the injured part, and then apply a roller to the fore-arm, from the hand to the elbow.

In all cases in which the radius is broken, a roller ought never to be put on with tightness, because the pressure can be of no service, and may do irremediable mischief, by forcing inwards the extremities of the fractured radius towards the interosseous space. Thus the bone may be made to unite in a very deformed way, and the pronation and supination of the hand may be utterly destroyed.

The fracture having been put in a state of coaptation, and a piece of the emplastrum saponis applied together with a roller, the next object is to place the fore-arm in splints, so as to preserve the broken bones in their right position until they have grown together again. The practitioner taking care to have the ends of the fracture as evenly in contact as possible, is to apply two splints; one is to extend from the bend of the arm to the middle of the fingers, the other is to reach from the outer part of the elbow to the ends of the metacarpal bones. Both these instruments are to be lined with pads of soft materials. What are termed jointed splints are not eligible for fractures of the fore-arm, because they tend to press the broken bones too much towards the centre of the limb, so as to diminish the interosseous space.

We must also caution surgeons not to employ too long a splint on the inside of the arm; for experience proves that when the fingers are kept completely extended during the whole treatment, they are sometimes a very considerable time in regaining a freedom of motion. The best plan is not to let the splint extend further than the point above specified, and the fingers will then naturally continue a little bent. When the splints have been arranged, they are to be fixed in their respective situations with a roller, which executes this office much more securely than pieces of tape.

Lastly, the fore-arm is to be placed in a sling, which should always support the limb from the elbow to the extremities of the fingers. Although every person, whether a surgeon or not, fancies himself capable of putting on a sling, the fact is, that many practitioners of extensive business are grossly ignorant of the proper way in which this common and most useful bandage ought to be arranged. We daily see people with broken arms, sprains of the wrist, whitlows, &c. walking about the metropolis with slings, which just support the hand, and leave all the rest of the limb swinging and moving about. Since all the foregoing cases demand quietude, the neglect to make the sling support the limb equally from the elbow to the fingers must be productive of serious harm, independently of the irksomeness which a patient always feels, who has his fore-arm kept for a long while in a slovenly bandage of this description.

Fractures of the Radius.

The radius is much more frequently broken than the ulna, on account of its situation exposing it more to external violence, and its having to bear all the shocks communicated to the hand.

When a person has fallen with his hand upon the ground with considerable violence, and immediately afterwards experiences an inability of performing the pronation and supination of the hand, there is great reason for suspecting that the radius is fractured. The surgeon however may easily ascertain the accident by examining the course of the radius with his fingers; or, by laying the fingers of his left hand on the upper part, or middle of this bone, while with his right hand he moves the hand and lower portion of the same bone alternately in the prone and supine direction, so as to make the ends of the fracture rub against each other, and give the sensation of a crepitus or grating.

The diagnosis in most fractures of the radius is plain and easy. However, a little obscurity is apt to prevail, when the bone is broken very high up near its tubercle, because here the fracture lies under the muscles arising from the external condyle. In order to detect the accident, the best plan which the practitioner can follow in this circumstance, is to place his thumb just under the external condyle of the os humeri, upon the upper round head of the radius, and then move the hand in the prone and supine directions. When the head of the bone continues motionless on making the experiment, and the patient complains of a good deal of pain, the surgeon may be sure that the upper part of the radius is fractured. A crepitus also may generally be distinguished.

Fractures

Fractures of the radius can hardly be difplaced in the longitudinal direction, on account of the manner in which the ends of the bone are attached to the ulna by means of the interoffeous ligament. The derangement is commonly of the tranfverfe kind, which confifts of an approximation of the ends of the fracture to the ulna.

In fractures of the radius, it is obferved, that the hand falls prone with much pain, becaufe the weight of this part of the limb makes the carpal bones and lower head of the radius turn on the fmall head of the ulna, while the upper portion of the broken bone remains motionlefs, the ends of the fracture confequently becoming feparated, and the foft parts injured. C. Bell's Operative Surgery, p. 184. vol. ii.

Fractures of the radius are to be treated in the fame manner as fractures of both bones of the fore-arm. An endeavour muft be made to keep the ends of the bone from inclining too much towards the centre of the limb. The fore-arm fhould be put in the mid-ftate between pronation and fupination; and particular care ought always to be taken to employ an inner fplint of fufficient length to reach the fingers, keep the hand fteady, and hinder it from falling into the prone pofition.

Fractures of the Ulna.

Fractures of this bone are much lefs common than thofe of the radius, and are generally produced by direct violence, that is to fay, by a blow, a kick, or a fall on the part. The radius, we know, is often broken by a force which is applied to the hand, but when the ulna is fractured, the accident is almoft always produced by fome violence which is applied immediately to the injured bone.

The lower end of the ulna is moft liable to be broken, becaufe it is the moft flender, and the leaft covered with flefh.

Fractures of the ulna are not apt to be fo materially difplaced as thofe of the radius. The diagnofis is alfo not fo plain as in the latter cafes, and indeed when the folution of continuity is towards the elbow, great attention is required to difcover what has happened. The furgeon fhould trace with his fingers the fuperficial parts of the bone, in order to find out whether there is any irregularity, and he fhould prefs with his two thumbs above and below any fufpected point, for the purpofe of feeling a crepitus.

The upper part of the ulna is never difplaced, the lower one alone can be fo.

A very little extenfion is generally requifite for the reduction of either a fractured radius or ulna.

The treatment refembles what has been advifed for cafes in which the two bones are broken together.

Fractures of the Carpus, Metacarpus, Fingers, and Thumb.

The fhape of the carpal bones, and the great quantity of cartilage which is placed around them, are circumftances rendering them little liable to be broken, except by the effect of fire-arms, and by fuch external violence as crufhes thefe bones, as it were, and does infinite mifchief to the foft parts.

The metacarpal bones are alfo not frequently fractured; but the accident is every now and then met with in practice.

With refpect to the treatment of fractures of the carpus, we have little to fay, becaufe the injury of the bones is of much lefs importance than that mifchief, which the foft parts have generally fuftained from the violence which produced the accident. Amputation will fometimes be more proper than any attempt to fave the limb. In other cafes the fore-arm and hand may be laid on a flat fplint, lined with a foft pad. The wound muft be dreffed or poulticed according to circumftances, and the limb kept quiet in a fling.

When any of the metacarpal bones are fractured, a cufhion or pad fhould be placed in the hollow of the palm of the hand and fingers. A roller is then to be applied from the fore-arm down over the wrift, the hand, and the pad.

The fingers are alfo liable to fractures. Thefe cafes, under proper treatment, generally terminate very favourably, without leaving behind the leaft impairment of the parts. After putting the pieces of bone into as even a ftate as circumftances will allow, the furgeon fhould take fome pafteboard foftened in vinegar, and accurately enclofe the broken part in it. Some tape may then be applied for the purpofe of retaining the pafteboard in the proper place. Certain furgeons next lay the hand and fingers on a flat fplint, and put on a roller, fo as to keep the parts from moving. The fore-arm and hand fhould be put in a fling.

After ten or twelve days, the applications fhould be taken off every day, and the finger bent and extended a certain number of times, in order to prevent anchylofis.

At the end of three weeks, the pafteboard, bandages, and fplint may be difufed.

In regard to fractures of the thumb, we need only remark, that they are very eafily detected, and demand the fame treatment as fimilar injuries of the fingers.

We have feen a fracture of the metacarpal bone of the thumb. The accident occurred to a porter, who fell backward with a load. The hand was kept on a finger-fplint, on which was put a tow-pad of fufficient fize to fill the hollow of the palm. A piece of the emplaftrum faponis was put over the injured part, the limb was confined on the fplint with a common roller, and the fore-arm and hand kept at reft in a fling.

The cafe united very favourably, but the union was not firm before the end of a month.

Fractures of the Thigh-bone.

The os femoris may be broken at any point, from its condyles below, to its round head above. However, experience evinces that by far the greateft number of fractures happen to the middle third of the bone.

Fractures of the thigh-bone are divided by writers into fimple and compound, comminuted and complicated, tranfverfe and oblique, &c.

It was an obfervation made by Petit, that the os femoris was much lefs frequently broken into feveral pieces than other more fuperficial bones. We may alfo remark that compound fractures of the thigh, like comminuted ones, are by no means common cafes.

The tranfverfe and oblique directions of the folution of continuity are circumftances which make a material difference in the degree of difficulty attending the treatment, as the reader will prefently underftand. Tranfverfe fractures are by far the leaft troublefome to unite, without any deformity being occafioned.

The fymptoms and changes produced in the limb by a fracture of the thigh-bone, are of the following defcription. A very fevere pain in the fituation of the injury greatly exafperated when the mufcles are feized with violent involuntary contractions, or when the member is at all moved by the furgeon. Such pain is no doubt excited by the manner in which the rough, fharp ends of the fracture muft irritate and injure the furrounding foft parts. The practitioner may ufually feel a plain crepitus on bringing the extremities of the fracture into contact, and then moving them. He alfo

may generally fee that a part of the limb bends, which naturally is quite firm and inflexible.

However, the principal changes, refulting from the folution of continuity of the bone, are four fpecies of deformity affecting the limb.

The firft kind is that which fhortens the member, and is called longitudinal. It takes place in confequence of the afcent of the lower portion of the broken bone, behind the upper piece, in the direction towards the tuberofity of the ilium. This rifing of the lower piece of the os femoris is immediately caufed by the contraction of fuch mufcles as originate from the bones of the pelvis, and are inferted into fome part of the limb below the fracture. Computing that the majority of thefe accidents affect the middle third of the bone, it follows that the chief mufcles in queftion are the triceps, femi-membranofus, femi-tendinofus, biceps, rectus, gracilis, and fartorius, moft of the other powers, deftined to move the thigh bone, being attached to it much above the place where moft fractures are fituated.

However, when the fracture happens higher up than the common fituation, an additional number of mufcles, and a larger quantity of mufcular fibres can act upon the portion of the os femoris below the fracture, fo as to draw up the leg, knee, and lower part of the thigh with a proportionate increafe of force. Hence it happens, when fractures of the thigh are high up the bone, there is always more fhortening of the limb, and the furgeon experiences more difficulty in preventing this effect than in other inftances.

It muft be obvious, alfo, to every one endued with common fenfe and an ordinary degree of reflection, that, as the furfaces of oblique fractures do not, like thofe of tranfverfe ones, mutually refift the paffage of one beyond the other, but glide over each other as foon as the mufcles having the above-defcribed power begin to act, oblique fractures muft always be much more fubject than tranfverfe ones to a fhortening of the limb.

That the mufcles do occafion the afcent of the lower portion of the broken bone, muft be manifeft to every body who knows that the bones are paffive parts, capable of no motion of themfelves, and deftined to be acted upon and moved by other powers. Were it neceffary to adduce any other argument to convince the undifcerning and fceptical, we might advert to the cafe related in "Les Œuvres Chirurgicales de Default," where the os femoris was fractured in a man, whofe lower extremities were paralytic, and confequently, whofe mufcles were incapable of action. As long as this ftate continued, the limb was not at all fhortened; but no fooner was the palfy removed by the application of the moxa, than the mufcles refumed their power, and the lower part of the thigh, together with the knee, leg, and foot, became drawn up towards the pelvis, as in ordinary cafes.

When the limb is placed in the ftraight pofition, the weight of the pelvis, and the prominence of the buttocks, foon make the bedding fink, in confequence of which circumftance, the furface of the bed is made to flope in fuch a manner that the patient's body flips from above downward, and pufhes before it the upper end of the fracture.

This occurrence augments the firft kind of deformity often attendant on oblique fractures of the thigh, by fhortening the limb in the longitudinal direction, and tending to make the ends of the fracture ride over each other.

The fecond fpecies of deformity, frequently feen in cafes of fractured thighs, is what is termed tranfverfe. It always accompanies the longitudinal deformity; but in certain inftances it may be prefent alone. We need hardly obferve that the word tranfverfe here means in the direction of the diameter of the bone, from any one point of the circumference to an oppofite correfponding one. The tranfverfe difplacement of a fractured thigh may take place without any longitudinal deformity, when the fracture is tranfverfe, and when one end of it is carried in one direction, while the other is drawn in the oppofite one; or when one end of the fracture continues unmoved while the other feparates from it. In this circumftance, the upper end of the fracture is not, as in the firft kind of deformity, unaffected by the contraction of the mufcles; but, by being drawn out of contact with the lower portion of the bone, in confequence of the action of the pectineus, pfoas, iliacus internus, and upper part of the triceps, it contributes to the tranfverfe kind of deformity.

The third fpecies of deformity, fometimes accompanying a fracture of the thigh, is what has been named angular, becaufe the two portions of the broken bone are made to form an angle with each other. It may be produced by the violence which caufed the fracture, the awkwardnefs of the affiftants in holding the limb, or by laying the member in an improper pofture.

The fourth and laft fpecies of difplacement to which fractures of the thigh-bone are liable, is what may properly be denominated rotatory, becaufe the lower piece of the broken bone is by it turned, either inward or outward, on its own axis. The rotation outward is exceedingly common, and claims the particular attention of the furgeon in the treatment. If it is overlooked, the patient is for ever afterwards afflicted with a diftortion of the toes outward, a turning of the infide of the foot forward, and a lofs of the proper ufe of the kind of tripod which is naturally conftructed in our feet, by the os calcis and balls of the great and little toes.

We fhall now confider the treatment of fractured thighs, a fubject highly interefting, and even at this day involved in controverfies. When we inform our readers that Pott is an advocate for one plan, and Default for an oppofite one; that many Englifh furgeons place the limb in a bent pofition, and that all or nearly all foreign practitioners prefer the ftraight one; it muft be manifeft that prejudice and error influence one fet of partifans or the other, as it is impoffible that one mode of treatment fhould be exactly as eligible as the other.

In the general remarks at the beginning of this article, we have noticed Mr. Pott's opinions refpecting the advantages to be derived from the relaxation of the mufcles connected with broken bones. We already know that this eminent furgeon conceived that a broken thigh might be laid in fuch a pofture as would relax the whole of the mufcles belonging to the injured part of the limb.

In enforcing his precepts, and endeavouring to point out what muft beft anfwer the purpofe of incapacitating the mufcles from difplacing the fracture, he obferves: "is it not obvious that putting the limb into fuch pofition as fhall relax the whole fet of mufcles belonging to or in connection with the broken bone, muft beft anfwer fuch purpofe?" Pott's works, vol. i. p. 389. edit. 1783. Alfo, in the next page, it is enquired, "what is the reafon why no man, however fuperficially acquainted with his art, ever finds much trouble in fetting a fractured os humeri? Is it not becaufe both patient and furgeon concur in putting the arm into a ftate of flexion, that is, into fuch a ftate as relaxes all the mufcles furrounding the broken bone?" Alfo, in page 393, Mr. Pott continues: "change of pofture muft be the remedy, or rather the placing the limb in fuch manner as to relax all its mufcles."

That to have all the mufcles relaxed in cafes of fractures, would

would be desirable were it also practicable, every one will admit; but, the possibility of accomplishing it, so long as different muscles have different uses, different situations, and different attachments to the bones, every one must grant to be no more than visionary. For instance, do not the patient and surgeon in the case of fractured os humeri, adverted to above, rather concur in putting the fibres of the triceps and anconeus into a state of tension, at the same moment that they relax the biceps and brachialis internus? The true reasons why a fractured arm generally unites favourably without much difficulty, might be more properly referred to circumstances mentioned in our observations on this case.

The small number of muscles; the manner in which these counteract each other; the way in which the weight of the lower portion of the broken part of the limb makes a permanent, though not a considerable, opposition to the ascent of the inferior fragment; the ease with which the fore-arm may be kept in a quiet state, in comparison with the difficulty of maintaining the leg in this condition during the treatment of a fractured thigh, &c. are causes satisfactorily shewing why there should be little trouble in the cure of the former case, and often a great deal in the management of the latter.

We have heard some persons, who do not undertake to defend the imperfect explanations of Pott, argue, that the half-bent position of the limb is the best, and that as it is the posture which the limbs assume during sleep, it is the most easy.

Richerand, in his Nosographie Chirurgicale, tom. ii. denies that the bent posture is the least irksome; and, as far as our observations extend, patients always make more complaint at being compelled to lie, for a long while, in the same position on their side, than of being necessitated to continue for an equal length of time on their backs.

With regard to the question, which position relaxes the greatest number of muscles capable of disturbing the coaptation of a broken thigh, we should maintain that the bent posture effects this desirable object. It more or less relaxes the triceps, semi-membranosus, semi-tendinosus, biceps, gracilis, and sartorius muscles, which can all contribute in a very powerful degree to draw up and displace the lower portion of the broken bone.

However, the most ardent advocates for the bent position will always be obliged to acknowledge, that it leaves a sufficient quantity of muscles unrelaxed, and still capable of disturbing the fracture. Hence, we are decidedly of opinion, that, estimating the good effects of any position as highly as possible, we shall always be under the necessity of allowing, that position alone will not do what Pott has represented, and it will never disarm and incapacitate the muscles so effectually, as to leave none capable of separating the ends of the fracture.

The preceding remarks tend to the conclusion, that, without neglecting whatever benefits may be derived from position, we should endeavour to increase the power of such mechanical contrivances as are intended to resist the action of the muscles on a broken thigh, and are calculated to keep the ends of the fracture in a steady state of coaptation.

We shall now describe the manner in which Mr. Pott recommended a broken thigh to be set and treated. We may premise, that he was in the habit of making the extension from the lower portion of the fractured bone, in order to accomplish the reduction. He states, that the position of the fractured os femoris should be on its outside, resting on the great trochanter; the patient's whole body should be inclined to the same side; the knee should be in a middle state between perfect flexion and extension, or half-bent; the leg and foot, lying on their outside, should also be well supported by smooth pillows, and should be rather higher in their level than the thigh. One very broad splint of deal, hollowed out, and well covered with wool, rag, or tow, should be placed under the thigh, from above the trochanter, quite below the knee, and another somewhat shorter should extend from the groin below the knee on the inside, or rather in this posture, on the upper side; the bandage should be of the eighteen-tail kind, and when the bone has been set, and the thigh well placed on the pillow, it should not, without necessity, be ever moved from it again, until the fracture is united.

Two splints are only enumerated by Mr. Pott. The generality of practitioners now invariably employ four. After placing the patient in the most eligible position, the necessary extension is to be made. Then the under splint, having upon it a broad, soft pad, and an eighteen-tailed bandage, is to be laid under the thigh, from the great trochanter to the outer condyle. The surgeon, before applying the soap-plaster, and the rest of the splints, must take care to make the fracture lie as smoothly as circumstances will allow.

We find that Mr. Pott advises the leg and foot to be raised somewhat more than the thigh. The propriety of this advice, however, is not very intelligible. Indeed, we are decidedly of opinion, that the method is wrong, for the following reasons. What is the kind of deformity most to be apprehended after a fracture of the thigh; is it not a shortening of the limb, accompanied with a distortion of the foot outward? What is the effect of raising the leg and foot more than the broken os femoris? Is it not to twist the condyles of the bone in the external direction? And must it not therefore be improper, because tending to promote a distortion of the lower part of the limb outward, the very kind of deformity which so often lames the patient, and throws disgrace on the art of surgery?

Were we to mention one particular circumstance which is more disadvantageous than any other, in the bent posture, we should feel inclined to say, it was the unconfined, or rather the moveable condition in which surgeons are accustomed to leave the leg and foot. Some contrivance ought undoubtedly to be made, with a view of fixing these parts in an unobjectionable posture. Whenever they move, they disturb the coaptation, and whenever they get out of a particular position, they distort the limb.

Some practitioners have proposed to place fractured thighs in a bent position, with the patient lying upon his back. The limb is to be laid on two boards, which meet and form such an angle at the back of the knee-joint as will make the thigh and leg bend in the desired way. The boards are to have two cushions placed along them, and the limb is to be prevented from slipping to either side, by wooden pegs for the purpose. Two splints are now to be applied to the thigh; perhaps a third one above might also be proper. Mr. Charles Bell has given an account of this method in his Operative Surgery, vol. 2, and we think that the proposal has sufficient merit to entitle it to a fair trial in practice. We think that we remember having seen, some years ago, an apparatus which was used at St. Bartholomew's hospital, and which could be employed in any position of the limb, in cases of both fractured legs and thighs.

We have next to treat of the straight or extended position, which was that to which Default gave the preference, and to which recourse is universally had on the continent. This plan of treatment also cannot be regarded as totally abandoned

abandoned in this country, there being some surgeons of eminence who still put it in practice.

The reasons assigned by Default against the bent posture are the following: the difficulty of making the extension and counter-extension when the limb is so placed; the necessity of then applying them to the fractured bone itself, instead of some part at a distance from the fracture, as for example the lower part of the leg; the impossibility of comparing with precision the broken thigh with the sound one, in order to judge of the regularity of its shape; the irksomeness of the bent position when long continued; the painful pressure made on the great trochanter; the disturbance of the limb, whenever the patient has a motion; the difficulty of fixing the leg so steadily as to prevent it from moving and displacing the fracture of the thigh; the utter impossibility of adopting such posture, when both thighs are fractured; finally, the plan having been attended abroad with little success.

Default also considers, that what is gained by the relaxation of some muscles in the bent position, is lost by the tension of others.

Perhaps, out of the preceding reasons, only a few could be selected, as carrying any material degree of validity. These appear to us to be the following; the irksomeness of the bent posture in which the patient is obliged to lie, for a long while, on his side; the painful pressure on the trochanter major; the moveable state of the leg; the ill success of the trials in France; the actually tense state of certain muscles, in a position which has often been called the *relaxed* one.

Default used to prefer applying the extending power to the foot, in order to have the advantage of a long lever, and to avoid pressing and irritating the muscles of the thigh, so as to make them resist the reduction of the fracture with increased violence. This mode of making the extension, it is obvious, cannot be followed in the bent posture, in which the thigh and leg are not placed in the same direction. However, the common reason assigned against making the extension on this principle is, that some of the force employed is lost on the intervening joint, which may likewise be injured by the violence. With respect to any of the force being lost, we could never discern how such a circumstance can happen; and the ample experience of Default has proved, that the other apprehension is destitute of foundation.

Default took care to put his patients with broken thighs on firm mattresses, which would not give way to the weight of the body, and allow a change of posture to take place. This method is highly deserving of imitation in all our public hospitals, whether the bent or the extended position be adopted.

Default maintains, that as the object of every apparatus for a fractured thigh should be to keep the ends of the fracture from being displaced, every mechanical contrivance employed, ought to be calculated for resisting the causes producing the displacement. These are, first, the action of such muscles as draw upward the lower end of the fracture; secondly, the weight of the trunk propelling downward the upper end. The preceding statement naturally leads to the conclusion, that every apparatus for an oblique fracture of the thigh should draw and keep downward the lower end of the fracture, and, at the same time, carry and keep upward the upper end of the fracture, and the trunk which is above it.

It is also explained by Default, that the apparatus should be capable of resisting the rotation of the lower portion of the broken bone, which ought to be quite firm and steady, even in case the limb should be suddenly moved.

The only few cases in which, according to Default, the power of the apparatus to keep upward the pelvis and superior end of the fracture, and to keep downward the inferior end, can be dispensed with, is, when the fracture is transverse, and not at all displaced in the longitudinal direction of the bone.

The same distinguished surgeon enters into a consideration of the effect of the different pieces of the apparatus for fractured thighs, and he endeavours to shew, that little dependence can be put in any of the means, unless they are calculated to make permanent extension.

Bandages have all one common mode of operating; they press the muscles towards the ends of the broken bone, and make them form a sort of natural case for the fracture. In short, bandages make a kind of lateral resistance to the parts. Upon this principle, they are of material service in preventing any displacement of the fracture sideways, and they are most useful when the solution of continuity is transverse. But, Default enquires, what is there to hinder the two inclined surfaces of an oblique fracture from slipping one over the other? What power is there to hinder the limb from receiving the effects of accidental shocks? Is the pelvis kept back? Is the action of the muscles resisted? Default, indeed, admits, that the last object is somewhat fulfilled by the pressure, and that in this operation the chief utility of the bandage consists; but, he asks, whether such compression will be adequate to prevent the longitudinal displacement of the bone, particularly when the bandage is slackly put on, as some practitioners recommend?

These remarks apply also to compresses; "petit moyen contre une grande cause."

Splints are useful in firmly fixing the limb, and guarding it from the effects of accidental shocks, or of contractions of the muscles. They operate more powerfully than bandages in preventing lateral derangement, and, hence, they suffice for transverse fractures, without any permanent extension being employed. They can also resist the rotation of the thigh outward, or inward. But, when the breach of continuity is oblique, will they hinder the ends of the bone from gliding over each other, and the consequent shortening of the limb? They obviously could only do so, by the friction of the different pieces of the apparatus, especially the tapes, which fasten it; and then, to make the resistance effectual, they must be tied so tightly as to create a danger of mortification. Will the splints prevent the trunk from descending, and propelling before it the upper end of the fracture? Will they paralize the action of the muscles on the lower end? Will they, in short, fulfil all the above indications? Their use is almost limited to preventing lateral derangement, and steadying the limb. Hence, they should extend along the leg, as well as the thigh, which is disturbed by the motions of the lower part of the limb.

The pads are chiefly useful in keeping the limb from being galled by the splints, and tend only trivially to keep the fracture from being displaced.

From the above account it appears, that the ordinary pieces of apparatus, which do not execute any permanent extension, may perhaps suffice for transverse fractures, which are not common; but, that they are always ineffectual, when the division is oblique, because they do not fulfil the two-fold indication of drawing downward the lower end of the fracture, and keeping the other one upward.

Default ascertained, that the object particularly to be

 aimed

aimed at, was ſuch a diſpoſition as that the foot, leg, thigh, and pelvis, ſhould conſtitute but one whole ; ſo that, though the different parts thereof ſhould be drawn in different directions, yet they ſhould ſtill, with reſpect to one another, preſerve the ſame mutual relation. He invented the following apparatus to anſwer theſe purpoſes.

A ſtrong ſplint, long enough to extend from the ridge of the os ilium to a certain length beyond the ſole of the foot, is a principal part of this apparatus: this ſplint ſhould be two inches and a quarter broad, and have each of its extremities pierced in ſhape of a mortiſe, and terminated by a ſemicircular niche. It is applied on the exterior ſide of the thigh, by means of two ſtrong linen bands, each being more than a yard long.

The middle part of one of theſe bands is to be applied to the inſide of the thigh, at its upper part ; its ends are brought to the exterior ſide of the thigh, paſſed through the mortiſe, and knotted on the ſemicircular niche. Compreſſes are to be previouſly placed under the middle part of the band, in order to prevent any diſagreeable preſſure ; as well as on the tuberoſity of the iſchium, which Deſault conſidered as the principal point of action of this band. The inferior part of the leg is, in the next place, covered with compreſſes, on which the middle part of the ſecond band is placed : the extremities of this band are croſſed on the inſtep and upper part of the foot, then on the ſole, after which they are conveyed outward, and one end paſſed through the mortiſe and knotted with the other on the niche, with ſuch a degree of force as to pull the inferior portion of the femur downward, and to puſh the ſplint upward, and, by this means, the pelvis and ſuperior fractured portion. On the internal ſide of the limb is placed a ſecond ſplint, which extends from the ſuperior part of the thigh to a certain diſtance beyond the foot. A third is placed on the anterior part, and extends from the abdomen to the knee. The ſuperior extremities of the anterior and exterior ſplints are fixed by means of a bandage paſſed round the pelvis. A band, the middle part of which is placed under the ſole of the foot, and the extremities croſſed on its ſuperior ſurface, and faſtened to the ſplints, prevents the motion of the foot, as do alſo the ſplints.

Before applying the apparatus, the whole limb is to be covered with compreſſes, wet with a ſolution of the acetite of lead. Over theſe, Scultetus's bandage is to be put, and a roller round the foot, all moiſtened in the ſame manner.

It ſhould be obſerved, that Scultetus's bandage was made on the ſame plan as the eighteen-tailed one. It conſiſted of an indeterminate number of diſtinct bands, three inches in width, and of a ſufficient length to paſs twice round the limb. It ſhould be applied from below upwards, in ſuch a manner, that two-thirds of the width of one fold may be covered by the ſucceeding one.

Fractures of the inferior Extremity of the Thigh, with Separation of the Condyles.

Some caſes of this deſcription are related in the Pariſian Chirurgical Journal. In one inſtance, the accident was produced by the kick of a horſe on the internal condyle of the left femur. The pain was ſo great, that the patient was obliged to ſit down on ſome ſtraw that happened to be near him. He reached home, leaping on his right foot ; which exertion greatly increaſed the pain, in conſequence of the motion making the lower part of the thigh ſwing backward and forward.

The following were the ſymptoms which were noticed : The thigh was found bent, and conſiderably ſhortened ; there was not much ſwelling about the knee, but ſome contuſion and ecchymoſis. The joint, when looked at tranſverſely, had a ſtretched appearance, and was more flattened from before backward than the oppoſite knee. The patella did not project ſo much as in its natural ſtate, and, when preſſed, ſunk between the condyles ; and, on preſſing the condyles together, was raiſed. The condyles admitted of motion on each other, could be ſeparated or moved in every direction, and were accompanied with a crepitus.

Theſe circumſtances evidently proved that there was a longitudinal fracture of the condyles. The body of the femur was alſo fractured above, an oblique ſolution of continuity deſcending in an oblique direction from about five inches above the external to within two inches of the internal condyle.

The ſtrong action of the muſcles of the thigh had drawn upwards that portion of the femur which was connected with the external condyle, and the upper portion of the bone had deſcended. The pointed edge of the latter piece had made a wound in the integuments, an inch and a half in length, on the inſide of the thigh a little above the condyle.

The patient was put on a ſtraw-bed, with a hard mattreſs underneath. Deſault obſerves, that it was formerly the cuſtom in the Hôtel Dieu to uſe feather as well as ſtraw-beds ; but, from the inconveniences ariſing from their heat, and their yielding unequally in caſes of fracture, their uſe is now diſcontinued, and hard mattreſſes ſubſtituted in their room. The dreſſings having been previouſly diſpoſed on the bed, the ſurgeon proceeded to examine the wound ; and, after diſengaging a piece of ſplintered bone, he proceeded to reduce the fractures in the following manner.

The counter-extenſion was made by fixing the patient to the head of the bed by proper bandages ; and, whilſt one aſſiſtant ſupported him under the axilla, a ſecond kept up an extenſion, by laying hold of the foot with one hand and the heel with the other, whilſt other aſſiſtants ſupported the pelvis and the ſuperior part of the limb, to prevent the parts being ſhaken. A little inconvenience was experienced from the contraction of the muſcles during the extenſion, and the bones were brought in a ſtate of appoſition without any difficulty.

The parts were maintained in their ſituation by two circular compreſſes, and by a bandage, ſimilar to that of Scultetus ; and the inequalities of the limb filled up with coarſe linen. The whole was ſupported by two ſtrong ſplints unequal in their length and about three inches in width, and covered with *drap fanon*.

The dreſſings, as before obſerved, being diſpoſed on the bed, were placed on the limb ; they were wet with the aq. veg. and applied in the following manner : whilſt the extenſion was kept up by aſſiſtants, the two circular compreſſes were made to croſs each other forwards, one on the knee and the other on the inferior part of the thigh. The bandage was then applied from the ſuperior part of the leg to the upper part of the thigh : the ſides were then filled up as before with ſoft linen. The ſplints were then applied, one on the inſide, and the other externally, in ſuch a manner that the preſſure ſhould be equal at all points. The edges of the *drap fanon* were then brought over the limb, and properly ſecured by means of tapes ; care was taken to tighten them ſufficiently near the fractured parts, and to tie the knots on the outſide of the ſplints, to prevent the inconvenience of preſſure. The ſplints deſcended ſufficiently low to be on a level with the ſole of the foot, but the outſide

ſplint

ſplint was conſiderably longer, and reached as high as the criſta of the ilium, whilſt the internal one extended only to the ſuperior part of the thigh. The upper end of the outſide ſplint was tied with a napkin round the pelvis, and properly ſecured by pins. In this manner the fragments of the bone were retained; but, in a fracture ſo complicated and oblique, little hope was entertained that it could poſſibly reſiſt the effect of muſcular contraction.

In the Hôtel Dieu, means have been ſucceſsfully employed to counteract the effect of the contraction of muſcles in caſes of fracture. Deſault here ſpeaks of permanent extenſion; a method reprobated by the generality of practitioners, as ſubject to inconveniences, which Deſault remarks he has never obſerved in the very conſiderable number of patients ſubmitted to the trial.

The patient was already ſo fixed to the head of the bed, by proper bandages round the body and under the axilla, that the trunk could not deſcend. The indication then left was to prevent the thigh bending on the pelvis; which was eaſily effected, by placing thick compreſſes behind the thigh, and paſſing, above the malleoli, the middle of a bandage, the ends of which were croſſed on the back of the foot, then tied at the ſole, and fixed to the foot-board of the bed.

This extenſion, ſo far from producing inconvenience to the patient, afforded him inſtant eaſe. He was fatigued from the jolting he experienced in his way to the hoſpital, but was free from fever: no medicine but a diluting ptiſan was ordered, and he was left to enjoy his reſt, which he ſtood much in need of. The next day, his ſymptoms, in every particular, were remarkably mild; it was only neceſſary to regulate his diet, and to keep the parts moiſt with the aq. veg. The day after, the ſame plan was obſerved; but, on the fourth day, the looſeneſs of the bandage, from the diminution of the ſwelling, rendered its re-application neceſſary. Suppuration began to take place in the wound: it was dreſſed in the ſame way as on the firſt day, and the dreſſings were re-applied with the ſame precautions.

The wound was dreſſed every two days till the ſixteenth, when it was cicatrized. Afterwards, the dreſſings were not renewed but when they were looſe. The parts were kept conſtantly moiſt with the aq. veg. and care was taken that the bandages, which procured the extenſion, were kept always tight.

The bandages, &c. were not totally left off till the ſeventy-fifth day, though the callus was ſufficiently firm ſome time before that period: all the fragments were united without deformity, and the thigh, within a few lines, was as long as the one on the oppoſite ſide; but the ſoft parts, round the articulation, were conſiderably thickened, and the patella ſeemed to form one piece with the femur.

Notwithſtanding this, the motion of the limb was ſoon reſtored, by bending and extending alternately the leg or the thigh, by means of a cuſhion, which, one day, was placed under the ham, and, the next day, under the leg; and by moving the patella, by means of the fingers, in every poſſible direction. The patient was ſoon capable of exerciſing it himſelf, and was able to walk with the aſſiſtance of crutches. The ſtiffneſs of the joint ſoon ſubſided, and, in three weeks, he was capable of bending, at a right angle, the leg on the thigh. He was diſcharged from the hoſpital at this time, with a certain aſſurance of ſoon recovering, by means of exerciſe, the perfect uſe of his joint. Pariſian Chirurgical Journal, vol. i.

Fractures of the Neck of the Thigh-bone.

Theſe caſes are generally conſidered as the moſt troubleſome fractures to which the os femoris is liable. The high ſituation of the ſolution of continuity in the bone confers on a vaſt number of muſcles the power of drawing upward the thigh, the knee, the leg, and the foot. When the bone is broken about the middle, we know that ſome of the triceps, together with the rectus, biceps, ſemi-membranoſus, ſemi-tendinoſus, gracilis, and ſartorius, has the power of pulling up the lower portion of the bone towards the pelvis; but, when the neck of the os femoris is fractured, a multitude of other muſcles alſo acquire this power, as, for inſtance, the upper part of the triceps, the pectinalis, the pſoas magnus, iliacus internus, and many others inſerted into the great trochanter.

A fracture of the neck of the thigh-bone is generally occaſioned by a fall on the great trochanter; but the accident may ariſe from a fall either on the knee or ſole of the foot.

The ſolution of continuity may happen either at the middle of the neck, where the neck joins the head of the bone, or, laſtly, where the neck unites with the great trochanter. In the laſt caſe, the fracture is ſituated on the outſide of the orbicular ligament of the joint.

The trochanter major itſelf is ſometimes broken off, at the ſame time that the neck of the bone is fractured.

In the majority of inſtances, the ſolution of continuity is ſaid to be tranſverſe, with reſpect to the direction of the neck of the bone. It was aſcertained by Deſault, that, in ſome caſes of this deſcription, the internal fragment is wedged in the external one; a circumſtance which is worthy of attention, becauſe it has been mentioned in explanation of the fact, which has often been noticed, of perſons walking home, after having broke the neck of the os femoris. Perhaps, this ability might, alſo, in ſome examples, be imputed to the circumſtance of the orbicular or capſular ligament of the joint remaining entire and unlacerated, while the ſolution of continuity is within it; for, it is plain, that, in this ſtate, the main portion of the thigh-bone cannot be diſplaced far upward.

The diagnoſis of fractures of the neck of the os femoris is not always eaſy. Sometimes the beſt and moſt experienced ſurgeons cannot extricate themſelves from doubt and uncertainty.

The patient always complains of acute pain on the ſlighteſt motion of the limb, and in general he becomes ſuddenly incapable of walking. The limb is ſhortened, but this change takes place in very different degrees in different examples. When the fracture occurs on the outſide of the capſular ligament; or when the fracture is on the inſide of the joint, but the ligament is lacerated; the main portion of the os femoris is likely to be drawn up to a conſiderable extent by the action of the muſcles, and, of courſe, the limb will be ſhortened in a remarkable manner. When the fracture is within the capſular ligament, and this ligament is entire, the aſcent of the thigh-bone will be materially limited and circumſcribed; and the degree of ſhortening of the limb, not being great, can only be found out by a careful compariſon of one limb with the other. Finally, when the ſolution of continuity in the neck of the bone is tranſverſe, and one fragment is locked in the other, there can be no ſhortening of the limb at all, and the patient may even be capable of walking.

The hurt limb may in general be rendered as long as the other by a moderate degree of extenſion; but, no ſooner does the ſurgeon leave off pulling, than the muſcles immediately draw the thigh upward, and ſhorten the limb again.

A ſwelling makes its appearance at the upper and front part of the thigh, proportioned in ſize to the extent to which the member is ſhortened.

When

When the limb is ſhortened, the trochanter major does not project as in the natural ſtate, but is drawn upward and backward toward the criſta of the ilium.

Default particularly noticed, that if the ſurgeon puts his hand on the great trochanter, and makes the limb rotate on its axis, this remarkable bony proceſs will be felt revolving on its own axis, as on a pivot, inſtead of deſcribing, as in the natural ſtate, the ſegment of a circle, of which the neck of the bone is the radius. The obſcurity attending this mode of forming a judgment will be in proportion to the nearneſs of the fracture to the head of the bone.

In almoſt all inſtances, the toes are turned outward by the action of the muſcles. Paré, Petit, and Default, however, have met with caſes, in which the foot has been turned inward. Perhaps, it may ſometimes happen that the weight of the limb will determine this poſition of the foot, particularly when the patient is old, debilitated, or in a faint condition.

An erroneous and pernicious doctrine has been maintained by ſome eminent men, among whom are profeſſor Ludwig, M. Sabatier, and M. Louis, that fractures of the neck of the thigh-bone cannot be cured without lameneſs and deformity. Theſe evils have been imputed to the deſtruction of the neck of the bone; a circumſtance which was thought to be unavoidable. The truth is, that lameneſs does not neceſſarily follow a fracture of the neck of the os femoris, as may be fully aſcertained by referring to the ſurgical writings of Boyer, Default, and Richerand. However, every man of experience will allow, that, probably in ſome very old ſubjects, no union ever takes place, and the lameneſs and deformity muſt then be irremediable.

The French ſurgeons treat fractures of the neck of the os femoris on the principle of permanent extenſion. Boyer executes this purpoſe by means of a machine with a ſcrew. Default, we know, was in the habit of making the permanent extenſion by means of a bandage applied to the foot. It becomes unneceſſary, however, to explain here the plan of treatment in the ſtraight poſition, as we have already ſaid enough of Default's apparatus in a preceding column, as well as of the principles which influenced his practice. We acknowledge the accuracy of moſt of his remarks on fractures; and we cannot refrain from expreſſing a hope, that we ſhall live to ſee ſome of his plans more extenſively tried by Engliſh practitioners.

In this country, fractures of the neck of the thigh-bone are generally treated in the bent poſition; though there are ſome ſurgeons, who put the limb in the ſtraight poſture with common ſplints.

Fractures of the Patella, Rotula, or Knee-pan.

The patella may be broken by external violence, or by a very powerful contraction of the extenſor muſcles of the leg, which are inſerted into it.

Authors ſpeak of tranſverſe, oblique, and longitudinal fractures; but, although the two firſt caſes are univerſally acknowledged, few writers admit the poſſibility of the laſt, unleſs as a conſequence of gun-ſhot wounds.

It has been remarked by M. Hevin, that a tranſverſe fracture of the patella is moſt frequently occaſioned by outward violence, while the leg is more or leſs in a ſtate of flexion; at which period, that bone is ſituated on the articular ſurface of the thigh-bone, with its two extremities firmly fixed.

The ſame kind of fracture is alſo found to be very often produced by the violent action of the extenſor muſcles of the leg, without any blow or fall upon the knee whatſoever. It is ſaid that theatrical dancers are particularly ſubject to the accident, on account of the ſtrong exertions which they are under the neceſſity of making in their various forced attitudes. Ruyſch mentions a caſe, in his Obſerv. Anat. Chir. in which the knee-pan was broken by the powerful contraction of the muſcles. He ſays, "Viſitavi cum magiſtro Petri Adriani filio, virum ſatis robuſtum, qui e ponte deſcendens, in terram ferè ceciderat; imò pede lubrico, reſiſtens tamen quantum potuit, in terram non fecerit prolapſus; ſed ab illâ reſiſtentiâ tranſverſim fracta eſt ejus patella, adeò quidem evidenter ut inter utramque partem locari potuerit manus, una enim ſuprà, altera infrà genu ſentiebatur." J. L. Petit alſo met with many fractures of the patella, which were cauſed by ſlips and efforts, without any direct application of external violence to the knee. The bone may even be broken in this way into ſeveral pieces.

It frequently happens that patients ſuppoſe the injury of the patella to ariſe from the fall, whether this is the fact or not, as they generally tumble down at the time of the accident; and the ſurgeon, without proper inquiry, would not be led to think that the accident is ſo often the mere effect of the contraction of the muſcles as it really is. The celebrated Camper firſt obſerved the fact, that very often the fall is the conſequence of the fracture, and not the fracture of the fall. By ſome cauſe or another, the line of gravity of the body is thrown backward; the muſcles in front exert themſelves to bring it forward again; the extenſors act on the patella; this breaks, and the fall follows.

Modern ſurgeons are ſo well appriſed of the circumſtance of the patella being very commonly fractured in the foregoing manner, that we are almoſt afraid of being deemed prolix for confirming the account by further facts. However, there are two inſtances, in Default's Œuvres Chirurgicales, deſerving inſertion on account of their being particularly ſtriking and convincing. One is the caſe of a ſoldier, who broke his patella in aiming a kick at a ſerjeant, whom, however, he miſſed. The other example is exceedingly curious: a man, on whom lithotomy had been performed, was ſeized, while in the operating theatre of the Hôtel Dieu, with moſt violent ſpaſms of his muſcles; and the extenſors of his legs, among others, acted with ſuch power, that, in the preſence of the ſpectators, they broke both the knee-pans.

In the caſes under conſideration, the pieces of the fractured bone are always more or leſs ſeparated from each other. This ſeparation is occaſioned by the contraction of the extenſor muſcles of the leg, the ſtrong tendon of which is implanted into the upper part of the patella, and even covers all the fore part of this bone in the form of an aponeuroſis. Sometimes the ſeparation is to the extent of four inches: in other examples, the interſpace is hardly perceptible, in conſequence of the patient having remained perfectly quiet from the moment of the accident, and the tendinous expanſion, which covers the patella and connects the fragments, being ſtill in an entire ſtate. Surgical writers adviſe us, in this circumſtance, to be careful not to rupture the aponeuroſis in queſtion, in examining the limb.

It ought to be underſtood, that the interſpace between the two portions of a fractured patella is not produced by a mutual and equal aſcent and deſcent of the upper and lower fragment. The upper piece may be drawn a conſiderable way upward by the action of the rectus, cruræus, and vaſti muſcles; but the lower one is capable of being acted upon by no muſcle, and can only be moved from the other by the flexion of the leg. It is on this account that the ſeparation is leaſt when the limb is extended, the upper fragment being then the only one which can be diſplaced. When the knee is bent, however, the lower fragment moves downward, at the ſame

time

time that the upper one is drawn upward, and, consequently, the separation must in this state be the most extensive.

Besides the separation of the two pieces of a fractured patella, there are other symptoms pointing out the nature of the accident. When the limb is extended, the upper fragment may be pushed down into contact with the lower one, and a crepitus be felt on making them touch each other. The case is also attended with an inability to walk, acute pain, and a quick swelling of the joint.

Instances have occurred, in which the tendon of the extensor muscles has been ruptured just above the patella; but a more common accident is the rupture of the ligament of the patella itself, below this bone.

The prognosis, generally delivered by the ancients, in regard to fractures of the patella, was very unfavourable. Ambroise Paré remarked that no person could recover from an accident of this kind, without a degree of lameness. Fabricius Hildanus, in speaking of a man, forty years of age, who fractured the knee-pan, observes, "Ab initio, et si ex arte curatus fuisset æger, nihilominùs tamen dolores acutissimi aliaque symptomata supervenerunt. Tandem dolore reliquisque sedatis symptomatibus, convaluit quidem, sed claudicatio ac summa imbecilitas totius cruris secuta est, ità ut non nisi maximâ cum difficultate ambulare, et tibiam ascendendo sublevare possit."

Is it true, that the weakness and lameness of the limb proceed, as Paré describes, from the callus preventing the knee from bending, and from the difficulty which the patient experiences in getting up rising surfaces? Fabricius Hildanus, who deemed the foregoing opinion admissible, ventures, however, to express a degree of doubt concerning it. "An fractâ patellâ," says he, "extuberantia calli talis esse possit, ut cavitatem hancce, quæ inter femur et os tibiæ magna est, adeò impleat ut motum actionemque genu impedire possit? Videmus enim, ut plurimum in reliquis ossium fracturis, nisi contusio ossis et periostei fuerit maxima, naturam tam decenter et eleganter connectere ossa, ut raro relinquatur fracturæ vestigium."

As an author in the Encyclopédie Méthodique remarks, if Fabricius Hildanus had only paid attention to the improper proceedings, followed at that time in the treatment of a broken patella, he would soon have discovered the true cause of the lameness, which was formerly a frequent consequence of the accident. As the fragments of the bone were not put into contact, a large cartilaginous mass was formed between them, which, not having the firmness of bone, permitted the two fragments to move separately for the rest of the patient's life; a circumstance which could not fail to impair the motions of the joint. It should also be observed, that sometimes the upper fragment was drawn up almost as high as the point to which the extensor muscles could contract, so that, of course, the power of extending the leg was nearly destroyed.

It is true, that, in the old practice, the knee-joint was kept so long without motion, that an anchylosis sometimes ensued; but, now that practitioners adopt the plan of habituating the articulation to gentle motion, after a certain period has elapsed, this consequence is hardly ever known.

Wander-Wiel, Ravaton, Pott, and some other writers, have maintained the doctrine, that a moderate interspace between the two fragments of a broken patella was advantageous, and conducive to the perfect functions of the knee-joint after the cure. Certain it is, that, in the majority of cases, the fragments are united by means of a ligamentous substance, instead of bone. But the opinion of the preceding authors seems to be by no means accurate. The patella is sometimes repaired by callus, without any ill effects; and Default always found the joint more perfect, the smaller the interspace between the fragments. When they were apart, he always found that the patient could not walk up rising surfaces, or pass over irregular ground, without considerable difficulty.

The indications, in the treatment of a fractured patella, are, first, to diminish the power of the rectus, cruræus, and vasti muscles, by adopting a position which will bring their origins and insertions as near to each other as possible, and, also, by compressing the same muscles with a roller applied over the thigh, from the groin to the knee.

Secondly, The lower fragment of the patella is to be put as near to the pelvis as possible, by extending the leg.

Thirdly, The upper fragment is to be pushed down into contact with the lower one, and fixed in this position with a compress and a few turns of a roller.

Fourthly, The extended position of the limb is to be permanently maintained, by means of a long splint, placed either along the back or the outside of the limb, and by laying the member on a surface which forms a gradual ascent from the tuberosity of the ischium to the heel.

The practitioner is first to direct the patient to lie on his back, and enjoin him not to bend his knee in the least. The leg is then to be perfectly extended, and the thigh somewhat bent on the pelvis. This posture is then to be preserved, by laying pillows under the heel, calf of the leg, and thigh. The patient's body and pelvis should also be properly raised forward, so as to approximate the anterior inferior spinous process of the ilium to the knee. The surgeon is now to apply a roller from the groin nearly down to the knee, observing to push downward the upper piece of the patella. When this has been brought into contact with the lower portion, it is to be prevented from ascending again by laying just above it a little square compress, which is to be fixed with a few turns of the roller.

Some writers have affected to think the application of a bandage to keep down the upper fragment quite useless, and even hurtful, by bringing on swelling, &c. However, experience has fully satisfied us of its utility; though we are perfectly convinced, that such surgeons as apply another bandage, to keep up the lower fragment, adopt a very wrong and useless step. For it must be allowed, that if the tight circles of a roller fulfil no surgical object, (and with respect to the lower fragment, which is quite fixed, they cannot,) they must be objectionable, on account of the manner in which they impede the freedom of the circulation in the limb.

A long splint, lined with a soft pad, is next to be applied all along the outside of the limb; or one, somewhat shorter, may be put under the thigh and leg. This splint, which will securely prevent all flexion of the knee, is to be fixed on with a roller.

It is a very good plan to lay the limb in a fracture box, in which a gradually ascending surface is formed by pillows properly arranged.

When a broken patella is united by means of a long ligament, with the upper fragment of bone very much drawn up, the extensor muscles of the leg, not being able to pull the part much further upward, are deprived of a great deal of their original power. In this circumstance Mr. Hunter used to advise the patient to sit on a table, and exercise these muscles, by alternately extending and bending the leg for a certain time every day. After this plan had been pursued for some while, Mr. Hunter recommended the patient to fix a weight on the foot. No doubt, in this way, a patient

a patient may regain a good deal of the ufe of the weakened mufcles.

When the knee-pan is fractured by external violence, as by the kick of a horfe, it often happens that the upper fragment is not drawn upward and feparated, in confequence of the parts not being fufficiently ruptured and lacerated. In this inftance, a bandage above the knee can anfwer no purpofe, and, as being likely to have a bad effect on the inflammation of the joint, it fhould not be employed. Here we muft truft to keeping the limb quietly extended. The chief indication is to avert the inflammation of the knee, by general and topical bleeding, the exhibition of mild faline purgative medicines, and the application of linen wet with the lotio aquæ lithargyri acetati to the joint itfelf.

Fractures of the Leg.

The leg is more frequently broken than the thigh; for, although it has the ftrength of two bones, one of which is a very ftrong one, it is greatly expofed to external violence. When both the fibula and tibia are fractured, the patient is incapable of bearing his weight on the injured limb; but when the fibula alone is broken, progreffion may ftill be executed, though with difficulty and pain. When the tibia is the only bone which is fractured, the patient cannot ufe his leg; for notwithftanding the fibula is entire, this bone is fituated out of the centre of gravity, and is too weak to fuftain the weight of the body.

Fractures of both bones of the leg may be either tranfverfe or oblique.

When the fracture is difplaced longitudinally, the lower fragments are generally drawn upwards and outwards, while the upper ones project inwards and forwards. An angular difplacement may alfo proceed from the action of the mufcles on the back of the leg, or from the weight of the unfupported lower part of the broken limb. In either of thefe inftances, the angle muft be falient anteriorly. However, if the member be placed in the ftraight pofition, and the heel be too much elevated, the angle may be falient in the direction backward. A fpecies of difplacement may alfo arife from an inclination of the foot too much inward or outward, the latter faulty pofition being that which is moft commonly met with.

The longitudinal difplacement can fcarcely happen in tranfverfe fractures, becaufe the oppofite bony furfaces reciprocally oppofe the paffage of one beyond the other. In oblique fractures, however, circumftances are different, and the furfaces of the broken bones are incapable of preventing each other from gliding upwards and downwards. Hence it happens, that the lower portions of the broken bones, in cafes of oblique fractures, are generally drawn upwards by the mufcles of the calf of the leg, while the fharp end of the upper piece of the tibia projects forwards, and may eafily be felt under the fkin.

Though fuch is the common difplacement of an oblique fracture of the leg, Boyer has explained that it is poffible for a different appearance to prefent itfelf. It may occur, that when the folution of continuity runs obliquely downwards and outwards, the lower portions of the fractured bones may produce the projection forward, inftead of the fharp end of the upper piece of the broken tibia.

We may readily conceive how eafy it muft be for a fimple fracture of the leg to be converted into a compound one, by the fharp projecting point of bone making its way through the integuments. In fact, this circumftance, which materially increafes the degree of danger, is exceedingly common.

A fracture of both bones of the leg is generally attended with the following fymptoms; acute pain, which is exafperated by every kind of motion of the limb; an alteration in the natural figure of the member, in which a kind of angle is formed by the foot and lower fragments being drawn backwards; an inability of walking, or ftanding on the limb; motion in the fracture, and a plain and manifeft crepitus on handling the parts.

When the leg is fractured high up, near the knee, the furfaces of the tibia are fo broad, that fometimes no difplacement whatever can be difcerned. But this advantage is more than counterbalanced by the danger of the knee-joint becoming inflamed, and affected with anchylofis, in confequence of the accident, and long confinement requifite for the union of the fracture. In this cafe, particular care muft be taken to move the knee very tenderly and gently three or four times a week, after the fracture has acquired a certain degree of firmnefs.

Fractures of the Tibia alone.

When the tibia is the only bone broken, the fracture receives a confiderable degree of fteadinefs and fupport from the fibula, which remains perfect, and acts like a fplint on the limb. Indeed, fractures of the tibia, near the ankle or knee, are fometimes by no means eafily detected, becaufe there is no difplacement, and the manner in which the fibula fupports the injured bone hinders the fractured furfaces from moving fufficiently on each other to communicate a diftinct fenfation of a crepitus. In certain examples, alfo, the degree of pain which patients have fuffered have not deterred them from making an imperfect ufe of the limb.

In examining a tibia fufpected to be fractured, the furgeon fhould trace the anterior furface of the bone, commonly called the fhin, and its fpine, or anterior fharp edge. This fhould be done for the purpofe of afcertaining whether any preternatural projection or inequality exifts; for as fuch parts of the bone are very fuperficial, being only covered with fkin, the leaft irregularity becomes perceptible to the furgeon's fingers. When this method does not difcover a fracture, the practitioner may put his fingers on any fufpected joint, and then move the ankle joint with a little freedom, by which means a crepitus will often be detected.

When the tibia is fractured alone, the accident has generally been produced by fome violence (fuch as a blow or kick), which has operated directly on the broken part.

Fractures of the Fibula alone.

The fibula may be broken by a fall, or a blow on the outfide of the leg, in which cafe the bone always gives way at the part to which the force is immediately applied.

Every one, who has the leaft knowledge of anatomy, knows very well that the fibula does not bear the weight of the body, and that it can never be broken by the impetus of the body on the leg, unlefs the tibia firft gives way. It is known to every ftudent that the fibula extends down the outfide of the ankle-joint, and fuch information makes it manifeft that the fibula can only be broken by a force directly applied to it, or by a twift of the foot. Operative Surgery, vol. ii. p. 206.

The latter kind of cafe was one, of which the celebrated Pott took particular notice, as, when care is not taken to relax the mufcles, confiderable trouble and difficulty occur in the treatment. It was remarked by this diftinguifhed furgical author, that when the tibia is forced from its juft and perpendicular pofition on the aftragalus, probably the capfular ligament, but always thofe ftrong ligamentous fibres, which connect the lower end of the tibia with the aftragalus and os calcis, muft be lacerated. Such is the cafe when the fibula breaks

breaks within two or three inches of the malleolus externus; when the inferior end of the fracture falls inward toward the tibia; when the malleolus externus is turned somewhat outward and upward; and the tibia, having lost its proper support, is forced off the astragalus inwards. To this perfect fracture, and partial dislocation, is sometimes added a wound in the integuments, made by the bone at the inner ankle.

Mr. Pott has ably explained, that in this example the difficulty in reducing the case, and maintaining the reduction, and the distortion of the foot upward and outward, are caused by the action of such muscles as have tendons passing behind the tibia and fibula, under the os calcis, or attached to these bones. Mr. Pott thought that the present instance served as a striking illustration of the utility of relaxing the powerful muscles. If the limb be laid on its outside, with the knee moderately bent, the muscles forming the calf of the leg, and those which pass behind the fibula and under the os calcis, are all put, according to Mr. Pott, into a state of relaxation and non-resistance; all the difficulty and trouble, in general, vanish immediately; the foot may easily be placed right, the joint reduced, and, by observing the same position, every thing will commonly succeed.

In whatever manner a fracture of the fibula is occasioned, the fragments cannot be displaced in the longitudinal direction. Their ends are always forced into the interosseous space towards the tibia.

A fracture of the lower portion of the fibula may always be discovered with moderate ease, on account of the superficial situation of this part of the bone, and the facility of feeling both a crepitus and any irregularity. When the fracture is higher up, more attention is necessary, because the bone is here covered with a larger quantity of flesh.

Treatment of Fractures of the Leg.

As in cases of broken thighs, there are here two different plans of treatment; in one, the straight position of the limb being preferred; in the other, the bent posture. However, as the advocates for the first method are not in this country numerous, and the same apparatus and splints are employed in both ways, it only seems necessary to explain the mode of setting a fractured leg, as commonly followed by the most eminent English surgeons. At the same time, we wish it to be understood, that in our opinion the straight position may occasionally be adopted with advantage, when particular reasons exist. Large abscesses and sores, sloughs, &c. on the outside of the leg or foot, might certainly render the straight posture most eligible, as removing a good deal of pressure off the diseased parts, and facilitating the renewal of the dressings.

The powerful muscles of the calf of the leg are to be relaxed by bending the knee and extending the foot, and the limb is to be laid in this position on its outside, with the foot properly supported. The surgeon is now, with his assistants, to make whatever extension and counter-extension may be requisite for reducing the fracture into an even state of coaptation.

We cannot use better splints than those employed by Mr. Sharp; only it is advisable to have them made of tin or wood, instead of pasteboard, which is not well calculated for withstanding the effect of any moisture, discharge, &c. with which these instruments must sometimes come into contact. Mr. Sharp's splints are particularly good, as in one of them a provision is made for the more easy support of the foot and ankle, and there is a prolongation of the lower, or fibular splint, for the purpose of keeping the foot steady.

The fracture having been reduced, the surgeon should carefully raise the leg a little way from the surface of the bed, by taking firmly hold of the limb, below and above the fracture, and elevating the broken bones together, in such a way as shall keep both the upper and lower portions, as nearly as possible, on the same level. At this moment, an assistant should put exactly under the leg the under splint, which has been previously prepared, by covering it with a soft pad, and laying over this an eighteen-tailed bandage. The leg is now to be gently depressed, till it becomes supported on the apparatus. The surgeon, before he proceeds further, should once more observe, that the ends of the bones are evenly in contact. Being assured of this important point, he is to apply a piece of soap plaster over the situation of the fracture, and lay down the tails of the bandage. Another soft pad, well filled with tow, is next to be put over the upper surface of the leg, and the other splint applied. The straps should be tight enough to make the splints prevent any motion of the ends of the fracture. The pressure of these hard instruments is often exceedingly painful, and even productive of sloughing and ulceration, unless the surgeon skilfully place soft materials between them and such parts as seem most liable to be injured in this manner; for instance, the lower end of the fibula; the outside and inside of the foot; the inside of the knee, &c.

Besides the two splints and pads already mentioned, when the fracture is oblique, and the heel has a great tendency to be drawn backward, this effect may be much counteracted by applying a compress and longitudinal piece of pasteboard, from the lower part of the belly of the gastrocnemius muscle to the heel, under the straps of the other splints. This method prevents deformity in a very powerful manner.

When there is a great deal of contusion of the soft parts, together with the injury of the bones, it is better, at first, to keep the leg wet with the lotion of sal ammoniac and vinegar, by means of linen dipped in this application, and put under the splints. The splints need not be taken off every time it is necessary to wet the linen again: it is quite sufficient to squeeze the fluid out of a sponge into the interspaces between the above instruments. Nothing is so prejudicial, in cases of fractured bones, as too frequently moving the injured parts.

Mr. Pott acknowledged, that, in the fracture of the fibula only, the position is not of much consequence; because, by the tibia remaining entire, the figure of the leg is preserved, and extension quite unnecessary. Still even here, he contended, that laying the leg on its side, instead of on the calf, is attended with one very good consequence, *viz.* that the confinement of the knee, in a moderately bent position, does not render it so incapable of flexion and use afterwards, as the straight, or extended position of it does, and, consequently, that the patient will be much sooner able to walk, whose leg has been kept in the former posture, than he whose leg has been confined in the latter.

We have just to remark, that when the straight posture is adopted, it is best to lay the limb in, what is called, a fracture-box.

Fractures of the Foot, Toes, &c.

The os calcis is now and then fractured, and, in general, by the fall of some considerable weight upon it.

When the soft parts, and the rest of the foot, are seriously bruised and crushed at the same time, it may be more proper to perform amputation at once, than try to save the limb. If the mischief, added to the fracture of the os calcis, is less alarming, the gastrocnemius and soleus muscles should be kept relaxed by bending the knee, and maintaining the foot extended, with the aid of compresses and a splint applied over the instep and front of the leg. If the integuments

ments are wounded, proper care muſt be taken to dreſs the cut part, and change the dreſſings as often as neceſſary. A roller ſhould alſo be put over the foot and leg.

The other tarſal bones cannot be fractured, without the operation of ſuch violence, as muſt infallibly cruſh a great part of the foot to pieces. In moſt of theſe inſtances amputation will be indiſpenſable; but, no more of the foot ſhould be removed than abſolutely neceſſary, as the reſt will be of infinite ſervice to the patient. It muſt be confeſſed, however, that very often the miſchief done is ſo great, that the operation muſt be ſo done as to remove the whole of the foot. The practitioner may then either operate at the ankle-joint juſt above this ſituation, or in the uſual place, a little below the inſertion of the flexor tendons of the leg, as his judgment may direct.

When the metatarſal bones, or toes, are fractured, and the ſkin is unwounded, the foot may be put on a ſplint adapted to the ſole in ſhape; a piece of the emplaſtrum ſaponis applied; and then a common roller. It is almoſt needleſs to add, the patient muſt remain in bed until the ſolution of continuity in the bone is repaired.

Boyer's Lectures on Diſeaſes of the Bones; Pariſian Chirurgical Journal; Encyclopédie Méthodique, Partie Chirurgicale; Richerand's Noſographie Chirurgicale; Cooper's Firſt Lines of Surgery, and Dictionary of Surgery; Ch. Bell's Operative Surgery; Pott's Chirurgical Works; and Les Œuvres Chirurgicales de Default, par Bichat.

Fracture, in *Mineralogy*. See Minerals.

FRADES, Dos, in *Geography*, a river of Braſil, which runs into the Atlantic, S. lat. 17°.

FRÆNUM, in *Anatomy*, a name given to ſuch parts as have the effect of confining the organs to which they belong. Thus there are the frænum of the tongue, and the fræna of the lips, ſee Deglutition; the frænum of the epiglottis, ſee Larynx; and the frænum of the prepuce, ſee Generation.

Frænum *Linguæ*, *Diviſion of*, an operation in *Surgery*, ſometimes neceſſary in order to enable infants to ſuck, and children to form the voice.

The membrane, which lines the mouth, forms underneath the tongue a kind of duplicature, by which this organ is connected with the neighbouring parts. The membranous fold, to which we have juſt now alluded, is ſometimes denominated by anatomiſts the anterior ligament of the tongue; but its common name is the frænum linguæ.

When this part extends further towards the point of the tongue, and particularly, when it is of a denſer ſtructure than ordinary, it may impede the free motion of the tongue in ſuch a manner, that the actions of ſucking, and of articulating words, will be prevented.

The method of removing this defect conſiſts of an operation which has the ſemblance of being exceedingly ſimple, ſince nothing more is requiſite, than to make a trifling cut in a part of very inconſiderable thickneſs. However, it is an undoubted truth, that, if ſuch inciſion be careleſsly performed, very bad and fatal conſequences may be induced. The ſubject, therefore, demands more attention than may be ſuppoſed.

The firſt circumſtance worthy of notice, is never to cut the frænum linguæ of new-born children, unleſs the operation be indiſpenſably neceſſary. A judgment of ſuch neceſſity cannot be formed from merely obſerving that the frænum is preternaturally diſpoſed, and that the child has ſome difficulty in getting hold of the nipple. The prejudices of ſuch perſons as have the care of children often make them find out errors of formation, which do not really exiſt; and every practitioner is frequently conſulted about infants, reputed to be tongue-tied, when there is nothing unnatural in the ſtructure and diſpoſition of the frænum linguæ.

It ſhould be well known by all ſurgeons that there are ſeveral cauſes which may prevent a child from ſucking, without the frænum linguæ being at all concerned. When the nipple is ſo ſmall that the child cannot get it ſufficiently into its mouth, or on the contrary, when the nipple is ſo large that the infant cannot fix it in its mouth; ſome time muſt elapſe before the child can habituate itſelf to this ſtate of things. There are alſo ſome infants who put their tongues againſt the roof of the mouth, inſtead of embracing with them the lower part of the nipple. Children of this deſcription are quite unable to ſuck, notwithſtanding they poſſeſs all the requiſite conditions for the performance of ſuch function. Sabatier obſerves, that in this laſt kind of caſe, it has been found in ſome meaſure neceſſary to teach the child how to move its tongue, by preſſing this part downward and keeping it in ſuch poſition with a ſpatula, until the nipple has been put into the mouth and properly taken hold of.

An opinion may be formed, whether the infant is defective in any of the conditions requiſite for the performance of ſuction, by introducing a finger into the mouth. When the child can inſinuate its tongue under the finger, which then lies in a kind of concavity on the upper ſurface of that organ; and when the child is alſo capable of drawing its tongue back, ſo as to occaſion an empty ſpace in the fore-part of the mouth, the ſurgeon may reſt aſſured, that, in the formation of the parts, there is no cauſe preventive of the action of ſucking. But when the infant is incapable of putting its tongue under the finger, and eſpecially when it is alſo unable to make a ſort of longitudinal groove on the dorſum of that organ, it becomes highly probable that the neceſſary degree of motion is prevented by the frænum, and that a diviſion of this latter part is indiſpenſable. There is no other admiſſible reaſon whatever for performing the operation; not even the apprehenſion, that the ſtate of the frænum may be a future impediment to the perfect production of the voice. For, ſhould this laſt fear be realized, the frænum may then be more ſafely divided than at an earlier period, becauſe the child will now have become more rational, more docile, and conſequently leſs apt to move about too much at the time, when the operator is engaged in making the neceſſary cut.

In ſome inſtances the frænum is found to extend too far forward, to the very point of the tongue, while, in other examples, it is obſerved not to be of ſufficient length to allow the tongue to be properly raiſed from the bottom of the mouth. The firſt kind of defect is ſaid to be that which is moſt commonly met with.

Every ſurgeon may readily inform himſelf by ocular inſpection, whether the frænum reaches along to the apex of the tongue; for, in the natural ſtate, it is well known that about a quarter of an inch of the under ſurface of the tongue, from the apex backward, is quite unconnected with the frænum. Alſo when this part, by reaſon of its ſhortneſs, ties the tongue too cloſely to the bottom of the mouth, the ſurgeon cannot raiſe the tongue to the palate with his own fingers.

The frænum linguæ is to be divided with a pair of very ſharp ſciſſars without points. The ſurgeon is to make the requiſite cut with his right hand, while the fingers of his left are employed in holding up the end of the tongue. The fingers having been found by ſome operators inconvenient on account of their thickneſs, which hinders the parts about to be divided from being well ſeen, ſome have uſed a kind of blunt fork for confining the tongue and rendering the frænum tenſe. Inſtead of ſuch an inſtrument, J. L. Petit was in the habit of employing the common director,

the

the handle of which was made flat, and with a fiſſure for the reception of the frænum.

Though we have mentioned theſe inſtruments, we have to remark, that modern ſurgeons univerſally prefer the uſe of the fingers of their left hand; and ſince we conſider every ſuperfluous increaſe in the number of ſurgical inſtruments as diſadvantageous to the real improvement of practice, we moſt heartily join in condemning both the blunt fork and Petit's inſtrument as totally unneceſſary.

Another method, undeſerving of recommendation, has alſo been put into practice. The ſciſſars, and one of the latter inſtruments, employed both the hands of the operator, who was obliged to get an aſſiſtant to ſupport the child's head. Now it was conceived, that the ſurgeon might be made to cut more than was required, and do miſchief, if the aſſiſtant failed in holding the head with a due degree of ſteadineſs. In order to avoid this exaggerated inconvenience, another inſtrument was invented, which was calculated for fulfilling all the indications at the ſame time. The inſtrument alluded to was a metallic ſheath, containing a biſtoury, and conſtructed with a fiſſure. The knife was retained by a mechanical contrivance on the right ſide of the fiſſure, in which the frænum was placed. On preſſing a ſort of ſtop, the blade became diſengaged, and moved with celerity acroſs the fiſſure, ſo as to cut the frænum. It was remarked by Petit, that the knife did not always do what was wiſhed, ſince the frænum ſometimes yielded, and was puſhed between the two plates of the metallic ſheath. Here it became entangled, and could not be got out without ſetting the ſpring again, a thing which the motion and crying of the child often rendered very difficult of accompliſhment. The accident depended on the very ſmall ſegment of a circle deſcribed by the knife, which, inſtead of being drawn along the part intended to be divided, as every cutting inſtrument ought to do, fell upon the frænum in a perpendicular manner. Hence Petit ſubſtituted ſciſſars for the biſtoury, and had one blade fixed on one ſide of the fiſſure, while the other blade was moveable, and kept ſeparated from its fellow by a little ſort of lock, which might eaſily be unfaſtened. On this being done, the laſt blade uſed to approach the one which was fixed, croſſing the fiſſure in which the frænum linguæ had been previouſly put.

In regard to any kind of concealed biſtoury, for the performance of the operation under conſideration, we have to ſtate that the ſurgeons of the preſent day invariably diſpenſe with all inſtruments, except a pair of very ſharp ſciſſars, without points.

Before the time of Petit, ſome bad conſequences, apt to be produced by the operation of dividing the frænum linguæ, had been little taken notice of by ſurgical authors. This eminent ſurgeon, however, had been impreſſed by experience with the knowledge of theſe dangers, and he wrote on the ſubject an intereſting paper, which is publiſhed among the Memoires de l'Academie des Sciences for the year 1742. One bad conſequence, to which we have made alluſion, is the ſuffocation of the child by the tongue turning backward. Another danger is an hemorrhage, which occaſionally follows the operation.

The frænum ſerves to confine the tongue, and keep it from being thrown too far backward in the action of deglutition. Now in the operation, if an unneceſſary, or too extenſive an inciſion be made, the tongue may be carried beyond the narrow part of the throat, and ſo engaged in the opening of the pharynx, as not to admit being brought back again into its natural ſituation. The firſt opportunity which Petit had of obſerving this event, was in a child that had died about five hours after its frænum linguæ had been divided, and whoſe body this diſtinguiſhed practitioner was requeſted to examine. Upon paſſing a finger into the child's mouth, he was ſurpriſed at not being able to feel the tongue, and at perceiving, that the poſterior opening of the mouth was completely ſtopped up by a fleſhy ſubſtance. As ſoon as an inciſion had been made through the cheeks, it became evident, that this ſubſtance was the tongue itſelf which had been thrown into the upper part of the pharynx in the effort of ſwallowing.

When M. Petit was ſent for to another infant which had fallen into a ſtate approaching to ſuffocation, about two hours after its frænum linguæ had been cut, he endeavoured to find out the cauſe of the occurrence. When he introduced his finger into the child's mouth, he found that the tongue was half diſplaced backward. There was no difficulty in reducing it; but the accident recurred ſeveral times in the courſe of the day. Petit conceived, that it was now neceſſary to have recourſe to ſome mechanical means for the prevention of the part becoming diſplaced. This purpoſe ſeemed to be anſwered by a thick compreſs, which was placed on the tongue, and retained by a band applied round the lower jaw. Whenever the child had occaſion to ſuck, the apparatus was taken off, and put on again immediately afterwards. The little patient was ſent into the country with a ſtrict injunction, that the nurſe ſhould continue for ſome time the uſe of the compreſs and bandage. The direction however having been neglected, the child was ſeized with ſymptoms of ſuffocation and died.

After the caſe, which we have juſt now cited, M. Petit met with other examples, in which children, affected in a ſimilar way, were ſaved by a perſeverance in the plan above deſcribed.

The ſecond dangerous conſequence, occaſionally reſulting from the operation of dividing the frænum linguæ, is an hemorrhage which takes place when one of the raminal arteries, or veins, is wounded. This kind of accident has long been well known, and all writers who have treated of the operation of cutting the frænum have not failed to notice it. M. Petit however has ſeen the ſame perilous occurrence take place, even when the large veſſels of the tongue were uninjured, and, of courſe, the bleeding proceeded entirely from ſuch ſmall veſſels as are diſtributed to the membrane of the frænum itſelf. The blood, which eſcapes from theſe veſſels, and collects in the child's mouth, induces the infant to make continual endeavours to ſuck, by which means the bleeding is kept up, until the weakneſs occaſioned is extreme. Several examples of ſuch hemorrhages were met with by the above ſurgeon. Unavailing attempts were made to ſtop the flow of blood by aſtringent applications, and badly contrived compreſſes. M. Petit deviſed a ſimple and effectual means of ſtopping the bleeding. The method conſiſts in taking a piece of birch, which is to be cut through below the place where two branches of equal ſize unite. The bit of birch is to reſemble a ſort of fork, the prongs of which are to be about eight lines long, and the handle four. The inſtrument is then to be covered all over with linen, and put under the tongue, in ſuch a way, that the end of the handle is to reſt againſt the middle of the concavity of the arch of the jaw, while the prongs embrace the frænum, and compreſs the bleeding veſſels. The middle of a roller is next to be applied to the dorſum of the tongue, as far back as poſſible, and the ends, after croſſing each other under the chin, are to be pinned to the child's night cap. In this manner, the veſſels are compreſſed from below upward by the prongs of the wooden fork, while the bandage makes preſſure from above downward. Thus the tongue is fixed, and the bleeding is ſtopped. De la Médecine Opératoire, par Sabatier, tom. 3.

FRAGA,

FRAGA, in *Geography*, a town of Spain, in Aragon, on the frontries of Catalonia. This is the ancient town of the Ilergetes, called by Ptolemy Gallica Flavia, and was of confiderable importance under the Moors, and under the kings of Aragon. It had a diftinct king under the former; but it is now reduced to a population of about 3000 perfons. It is fituated on the left bank, or eaft and north of the river Cinca, which bathes its walls, between two mountains, on the fides of which it is built. The ftreets are narrow, crooked, hilly, and badly paved with fharp pebbles. The houfes are badly conftructed, and appear like huts or ruins, though many of them are decorated with armorial bearings. This town is in the diocefe of Lerida, belonging to Catalonia, and is the refidence of a vicar of the bifhop. It has two alcades, eight regidors, three gates, a convent of Grand Auguftins, and two parifh churches. A handfome quay has been lately built upon the bank of the river Cinca. This place was formerly a fortified town, and defended by a caftle, now in ruins. It fuftained feveral fieges under the Moors, and refifted the armies of Aragon in 1133 and 1134; and Alphonfo I. king of Aragon, was flain under its walls. Fraga was at laft taken in 1147 by Raymond Berenger, count of Barcelona, who had afcended the throne of Aragon, in confequence of his marriage with Petronilla, the daughter and heirefs of king Ramirez. At the commencement of the 18th century, in 1705, it was taken by the troops of the archduke Charles, but fhortly afterwards retaken, and fubjected to Philip V. The Catalonian language is fpoken at Fraga, and the manners of its inhabitants refemble thofe of the Catalonians. The quay leads to a handfome wooden bridge, of 22 arches, over the river Cinca; and near it is a convent of capuchins, having an immenfe inclofure, with a large and beautiful garden. It is diftant 53 miles E.S.E. of Saragoffa. N. lat. 41° 27'. E. long. 0° 17'.

FRAGARIA, in *Botany*, fo called by the Romans, from *fragro*, to fmell fweet or powerfully, on account of the perfume of its fruit.—Strawberry.—Linn. Gen. 255. Schreb. 342. Willd. Sp. Pl. v. 2. 1090. Lamarck. Dict. v. 2. 527. Mart. Mill. Dict. v. 2. Sm. Fl. Brit. 546. Juff. 338. Tourn. t. 152. Gærtn. t. 73. Clafs and Order, *Icofandria Polygynia*. Nat. Ord. *Senticofæ*, Linn. *Rofaceæ*, Juff.

Gen. Ch. *Cal.* Perianth inferior, of one leaf, flat, in ten fegments; the five alternate ones external and narroweft. *Cor.* Petals five, roundifh, equal, fpreading, inferted by their fhort claws into the calyx. *Stam.* Filaments 20, awl-fhaped, fhorter than the petals, inferted into the calyx; anthers crefcent-fhaped. *Pift.* Germens numerous, very fmall, collected into a head; ftyles fimple, inferted laterally into each germen; ftigmas fimple. *Peric.* none. A fpurious berry is formed of the common receptacle of the feeds enlarged and become pulpy, foft, coloured, of a roundifh ovate figure, abrupt at the bafe, deciduous. *Seeds* numerous, minute, pointed, fmooth, naked, fcattered over the furface of the receptacle.

Eff. Ch. Calyx inferior, in ten fegments. Petals five. Receptacle of the feeds ovate, pulpy, deciduous. Seeds fmooth.

Linnæus, difgufted with the futile diftinctions of the gardeners of his time, efpecially in Holland, fometimes ran into a contrary extreme among plants the moft generally cultivated; and confidered as varieties what are really diftinct fpecies; differing in their native countries, their qualities, and even their botanical characters when inveftigated according to his own foundeft principles of diftinction. This it appears to us he has done among the different kinds of ftrawberry, reducing them all principally to one fpecies. On this fubject very great light has been thrown by the labours of Duchefne, in his excellent *Hiftoire Naturelle des Fraifiers*, printed at Paris in 1766. This is a model of accurate and ingenious obfervation and criticifm, and Haller juftly terms it "an excellent little book." In it the author inveftigates the characters and qualities of all the kinds of ftrawberries known to him, traces their origin, their relationfhip to each other, and their fynonyms in books, with the greateft accuracy and clearnefs. The fubject is followed up by the fame writer in an effay communicated by himfelf, and figned with his name, in Lamarck's *Dictionaire de Botanique*, v. 2. 528. In thefe publications the only error perhaps is an hypothetical idea of the plants in queftion being, fomehow or other, all defcended from a common ftock; confequently there is no attempt at a difcovery of folid fpecific differences; and this poffibly confirmed Linnæus in his original error refpecting them, though he was furnifhed by Duchefne with excellent fpecimens of all the kinds, which ftill remain in his herbarium, and which might well lead to a fufpicion at leaft, if not a ready detection, of certain fpecific diftinctions. This error has been corrected, in the moft mafterly manner, by Ehrhart in his *Beiträge*, fafc. 7, publifhed at Hanover in 1792, who, by attending to the pubefcence of the ftalks and its direction, has determined the fpecies beyond difpute, corroborating the leading diftinctions derived from habit, native country, &c. in Duchefne's works; fo that we prefume the fpecies of *Fragaria* can hereafter never be obfcure, whatever new varieties may arife, or old ones difappear. We do not indeed find fome other characters, derived by Ehrhart from a comparifon of the terminal ferrature of each leaflet with its next neighbours, fo much to be depended on, but thefe are not wanted. The direction of the pubefcence, fo ufeful in Mints, fee *Tranfactions of the Linnæan Society*, v. 5. 171. and in *Myofotis*, fee *Engl. Bot.* t. 1973, and *Introd. to Bot.* 228, is all-fufficient. Willdenow has very judicioufly profited by the remarks of Ehrhart, only following Linnæus in erroneoufly confidering the fimple-leaved ftrawberry as a fpecies. We fhall try to arrange and define the fpecies of *Fragaria*, by the lights which thefe writers afford; only as we do not affent to Duchefne's hypothefis of their common origin, we fhall difpofe them according to our own ideas of their botanical affinities. We fhall endeavour to refer each variety, as far as we have feen any, or can judge by the accounts of Duchefne, to its proper fpecies. We cannot however undertake even to enumerate all the evanefcent varieties of gardeners, whofe intereft it is to bewilder the fubject by extolling the flighteft novelties, or recommending old plants under a new name. This is too much practifed, not by the intelligent leaders in the trade, but by fuch as have no other means of exciting notice. If we fhould feem to any perfons, fkilled in the different merits and qualities of thefe fruits, too flight in our notice of fome of their diftinctions, we beg leave to remind them of the endlefs varieties of apples and pears, all produced by feed, and fooner or later returning to their common origin. Even in the common crab, wild in our hedges, accurate enquirers may difcover great differences in flavour and quality, which render the varieties of fruit in wild ftrawberries, and ftill more in cultivated ones, perfectly credible, and guard us againft the erroneous multiplication of fpecies.

1. F. *vefca.* Wood Strawberry. Linn. Sp. Pl. 708. Fl. Suec. 175. Engl. Bot. t. 1524. (Fragaria; Camer. Epit. 765. Brunf. Herb. v. 2. 35. F. fylveftris; Duchefne 61. Lamarck Dict. n. 2. F. vulgaris; Ehrh. Beitr. n. 1.) Calyx of the fruit reflexed. Hairs of the leaf-ftalks widely fpreading; thofe of the partial flower-ftalks erect. Native of groves and thickets throughout the colder parts of Europe. Dr. Sibthorp found it in the woods of the Bithynian Olympus,

Olympus, and in ſome parts of Greece. In Sweden and Lapland it is ſtill more abundant than with us, ſo that it is ſcarcely neceſſary to keep Strawberries, except exotic kinds, in a garden. The *root* is fibrous, or rather woody, perennial, encreaſing by buds, as well as by long creeping ſhoots or runners. *Stem* none. *Leaves* ternate, on long hairy ſtalks, ſomewhat ovate, ſtrongly ſerrated. *Flower-ſtalks* longer than the leaves, erect, hairy, ſomewhat cymoſe. *Flowers* white, erect, ſpreading. *Fruit* drooping, ovate, fragrant, highly grateful and aromatic. Such likewiſe is the general habit of the genus; but this ſpecies, which is the ſmalleſt, is diſtinguiſhed by its acid fruit of a deep carmine red, and eſſentially by the ſilky hairs of its partial or ultimate flower-ſtalks being erect, or often cloſely preſſed upward to the ſtalk, which unfortunately is not properly repreſented in *Engliſh Botany*; but the excellent old wooden cuts above quoted, expreſs it by not ſhewing any hairs on that part, while the main flower-ſtalk, as well as the footſtalks, of the leaves, are juſtly drawn rough with prominent or horizontal hairs. This character remains in the dried ſpecimens. Ehrhart has not diſtinguiſhed between the hairs of the general and partial flower-ſtalks. He and Willdenow ought, in all the caſes in queſtion, to have uſed the word *pedicellus*, not *pedunculus*. The Wood Strawberry flowers in May and June. By cultivation the leaves grow larger, but the fruit is little changed. The varieties are

a. With variegated leaves. Ducheſne 69.

b. With white fruit. Ducheſne 71. This writer remarks, that the points of the ſerratures of the leaves alſo are white, though in all red-fruited Strawberries they are red; a curious obſervation, which helps cultivators to diſtinguiſh this variety at all ſeaſons.

c. With a double flower. Ducheſne 74. In this the petals are very much multiplied, but ſo many ſtamens ſtill remain unchanged, that the fruit is generally perfected.

d. With cluſtered fruit, as deſcribed by E. Konig in the Ephem. Nat. Curioſ. for 1685. Ducheſne 79. This was unqueſtionably the mere accident of a faſciculate or cluſtered ſtalk, as happens in the ſtem of the Top-knot Pea, and occaſionally in the Aſh, Holly, Spurge-laurel, and ſeveral other plants. See FASCICULATE.

e. With prickly fruit. Ducheſne 82. Fragaria muricata; Linn. Sp. Pl. 709. Lam. Dict. n. 8. F. veſca β. Sm. Fl. Brit. 546. F. elatior β; Willd. Sp. Pl. v. 2. 1091. F. ſpinoſo fructu; Barrel. Ic. t. 90. F. arborea con fiore erbaceo; Zannon. Iſt. 95. t. 38. This was obſerved by Tradeſcant in a garden at Plymouth; ſee Gerard's Herbal by Johnſon, 998. Ducheſne ſaw an original ſpecimen of Zannoni's, who cultivated this plant at Bologna. The former reduces it, very ſatisfactorily, to the F. *veſca*, and aſſures us the prickly appearance of the fruit, which is not eatable, is owing to an elongation of the point of each germen. This variety, after having been kept in the botanical gardens of Europe, by way of a curioſity, for three or four ſcore years, has, according to Ducheſne, at length totally diſappeared, having no valuable quality to recommend it.

f. With abortive fruit. Ducheſne 107. Blind Strawberry. F. abortiva; Lam. Dict. n. 11. A ſtronger, more hairy, and darker-coloured variety than the common Wood Strawberry, in which reſpects it approaches the Hautboy hereafter deſcribed. The fruit is for the moſt part abortive, which Haller attributed to a defect in the ſtigmas, and Miller to an exhauſtion of the plant by runners; but Ducheſne now ſeems to doubt the accuracy of both theſe explanations, though without propoſing any in their ſtead. He conſiders it as rather belonging to the next than to this. See F. *collina*, var. *d.*

g. The Monthly or Alpine Strawberry. F. ſemperflorens; Ducheſne 49. Lam. Dict. n. 1. F. veſca γ; Willd. Sp. Pl. v. 2. 1091. Differs from the Wood Strawberry in having a rather leſs luxuriant herbage, while on the other hand it produces more abundant flowers and fruit, continuing in bearing to the very end of autumn, which renders it well worthy of cultivation. The fruit differs in nothing from the Wood Strawberry, being like that occaſionally white. This monthly variety is wild on the Alps, eſpecially, as it is ſaid, on Mount Cenis, where, indeed, it has but few months of open weather to bloſſom in. Ducheſne is diſpoſed to conſider this as the parent of the Wood Strawberry, and indeed the head of the whole family, becauſe of the vigour of its vegetation. This to us is rather paradoxical, eſpecially as he ſays it degenerates, which is not a ſymptom of a primary ſpecies, but the true teſt of a variety.

h. Engliſh Forcing Strawberry. Fragaria minor; Lam. Dict. n. 3. A dwarf variety, preferred for forcing in frames, of which there is alſo a ſort with white fruit. Ducheſne had it from England.

i. Freſſant's Strawberry. Fragaria hortenſis; Ducheſne 113. Lam. Dict. n. 4. This appears evidently, by Ducheſne's deſcription and ſpecimens, to be but a ſlight variety of the Wood Strawberry, raiſed accidentally from ſeed, whoſe fruit is 15 or 20 times larger than the wild kind, but of a fainter flavour in proportion. It abounds at Montreuil, where it was firſt raiſed by a man named Freſſant. Tournefort and Vaillant appear to have miſtaken this variety for the Fragaria parvi pruni magnitudine of Bauhin, or Hautboy Strawberry, our F. *elatior*. The fruit is occaſionally white. Freſſant's Strawberry was, according to Ducheſne in Lamarck, the only one to be found in the markets of Paris in 1790. Each root bears fruit but two ſucceſſive ſeaſons, and then periſhes, the preciſe kind being kept up from the runners, as in other caſes.

k. Strawberry without runners. Ducheſne 119. Fragaria efflagellis; Lam. Dict. n. 5. Sometimes called the buſhy ſtrawberry, as it forms luxuriant large tufts, but without runners, or with very few and ſhort ones.

l. Simple-leaved Strawberry. Fragaria monophylla; Ducheſne 124. Journ. d'Hiſt. Nat. v. 2. 343. t. 41. Uſt. Annal. faſc. 14. 40. t. 1. Lam. Dict. n. 6. Linn. Syſt. Veg. ed. 14. 476. Willd. Sp. Pl. v. 2. 1093. Ait. Hort. Kew. v. 2. 212. Curt. Mag. t. 63. Ducheſne moſt explicitly aſſures his readers, in the places here cited, that this is a variety raiſed by himſelf at Verſailles in 1761, from ſeed of the Wood Strawberry, and that when propagated by the ſame means, every generation returns more and more to the original ſpecies. Nothing can be more deciſive, and yet Linnæus, and after him Willdenow, retains it as a diſtinct ſpecies. Its appearance, indeed, is ſtriking, the leaves being ſimple and cordate, and the calyx ſingularly luxuriant and leafy. The fruit is like a fine Wood Strawberry. This variety increaſes very plentifully by runners.

2. F. *collina*. Green Strawberry. Ehrh. Beitr. n. 6. Willd. Sp. Pl. v. 2. 1093. (F. viridis; Ducheſne 135. Lam. Dict. n. 15. Ger. em. 998. Park. Parad. 528. F. veſca *a*; Linn. Fl. Lapp. ed. 2. 175. β; Fl. Suec. 175.) Calyx of the fruit erect, elongated, pointed. Hairs of the leaf-ſtalks widely ſpreading; thoſe of the partial flower-ſtalks erect.—Native of Sweden, Germany, and Switzerland. Ducheſne's ſpecimen has very much the habit and characters of the foregoing ſpecies, but differs in the *calyx*, which, after flowering, always remains erect, cloſely embracing the fruit, its ſegments being remarkably narrow, elongated, and pointed. The *fruit* is pale and greeniſh, with a yellow caſt, of a ſweet taſte and high flavour. Miller confounded this with the

the Pine Strawberry hereafter defcribed, and in the lateft edition of his Dictionary has left out the Green Strawberry, apparently from thinking it the fame with the Pine, though nothing can be more unlike. Ehrhart, who feems to have known it in a wild ftate, has eftablifhed it as a fpecies, and Duchefne's original fpecimen anfwers to the above characters. The latter had his plants from England. We have not of late met with this Strawberry, but more than thirty years ago it was cultivated in an old garden at Watlington, Norfolk, and called the Pine Strawberry, probably in confequence of Miller's error. Ehrhart feems to have been in doubt whether the Green Strawberry were the fame with his *collina*, the *Bröfling* of the Germans; but as Duchefne reckons it the beft known of that race, or rather fpecies, which he terms *Breflinge*, we take it for the leading variety, and range the following under it.

a. German dark-leaved Strawberry. Fragaria nigra; Duchefne in Lam. Dict. n. 12. F. minor, feu nigra; Thal. Harcyn. 43. Bröfsling, Fraga ferotina; Camer. Kreuterb. 335, 2. Bauh. Hift. v. 2. 394. Harbeer; ibid. 395. Fragaria foliis hifpidis; Rupp. Jen. ed. Hall. 108. F. ε, Prefling; Hall. Hift. v. 2. 44. F. β; Hall. Gott. 108. F. fructu majori candicante oblongiufculo; Volck. Noriberg. 172. Fragum album; Tabern. Kreuterb. 346. f. 2.—This might perhaps, more properly than the Green Strawberry, be deemed the original fpecies, being certainly in a wild ftate. It is called *nigra* by Thalius and Duchefne, on account of the dark hue of the leaves. The latter mentions having had roots from Haller, and that the *fruit* adheres firmly to the calyx. Its colour is green, tinged of a brownifh red on the fide expofed to the fun. The flavour almoft too highly perfumed. The pulp fwells much between the feeds. The *leaves* are low and very brown, often in five parts. It is late, and a bad bearer, and feems to want improvement by culture, yet when raifed from feed for fome years, Duchefne found no amendment in its quality. The German writers above quoted in general fpeak of the fruit as white, but often tinged with red on the funny fide. The only figure we can find is that of Tabernemontanus, which we have cited on account of the erect, narrow, elongated calyx, which conftitutes the character of the prefent fpecies and all its genuine varieties.

b. Burgundy Strawberry. Fragaria pendula; Duchefne in Lam. Dict. n. 13. Called Fraifier-marteau, or Hammer Strawberry, from the fhape of its fruit, which is rather more coloured than in the former variety, with a lefs powerful flavour. No feeds are produced on that part of the fruit covered by the calyx. It was received from Burgundy in 1768, and is confidered, even by Duchefne himfelf, as very near the laft variety.

c. Rough-leaved Strawberry, Fragaria hifpida; Duchefne in Lam. Dict. n. 14. F. foliis hifpidis; Bauh. Pin. 327. Mapp. Alfat. 110. Fraga partim rubra partim candida; Trag. Hift. 500. We cannot clearly perceive how this variety differs from our firft, *a*, nor can we at all diftinguifh their fynonyms. Ehrhart clearly unites them, and we mention them feparately rather out of deference to Duchefne, who fays the *leaves* are very rough, the *fruit* more elongated, more coloured, more juicy, and better than in our *a* and *b*; but the plant is often barren in the bois de Boulogne near Paris, where it grows in a ftate of nature, having poffibly come out of the adjoining gardens made by Francis I.

d. Fragaria abortiva; Duchefne in Lam. Dict. n. 11, which we have mentioned, according to that writer's original opinion, under the former fpecies, variety *f*, feems rather, by the calyx of his fpecimen, to belong to the prefent, as he now feems difpofed to confider it. As however it is probable that both fpecies may be fubject to the fame difeafe, and therefore we have ventured to indicate it under each.

e. Swedifh Strawberry. Fragaria pratenfis; Duchefne in Lam. Dict. n. 16. F. vefca β, pratenfis; Linn. Sp. Pl. 709. γ; Fl. Lapp. ed. 2. 176. Fl. Suec. 175. F. fructu parvi pruni magnitudine; Rudb. Act. Suec. ann. 1720. 97, but not of Bauhin. We place this here on the authority of Duchefne, who informs us he received roots from Linnæus in 1765, which fucceeded well, and the race remained unaltered when propagated by feed, except that the fruit was fometimes encreafed in fize. "It has fmaller *fhoots* and more contracted *runners* than any other ftrawberry, with a low and mean *foliage*, which dies and difappears entirely in winter, a circumftance peculiar to this variety. The *fruit*, however, is pretty large, bright green with a very deep red tinge, perfectly round, firmly fixed to the calyx, fo as to make a noife when pulled from it. The pulp is folid, friable, very juicy, exquifitely perfumed, and much fwelled between the feeds, which are very large. It is rather late in ripening, but bloffoms again directly, and often perfects a fecond crop of fruit. The firft bloffoms come out of the ground like an Anemone, before the leaves are fully grown."—We find in the Linnæan herbarium under *F. vefca*, two fpecimens anfwering to this defcription, and their petals are twice as large as the real *F. vefca* or wood ftrawberry which accompanies them, on another fheet of paper, and is precifely our Englifh kind. The *leaves* of the former are extremely filky at the back, and have the fhort terminal tooth mentioned by Ehrhart as a character of his *F. collina*, but on this laft mark we would not lay much ftrefs in this genus. The *fruit* in the Linnæan fpecimen is unluckily not far enough advanced for us to decide whether the calyx in that ftate be erect or not, fo that we can at prefent only rely on Duchefne for its belonging to this fpecies and not to the wood ftrawberry, nor to the Hautboy hereafter mentioned, the calyx of both which, when in fruit, is fhort and reflexed. Linnæus fays this plant grows in meadows clothed with fhort grafs. It is lefs common than the wood ftrawberry, and not fo fragrant, but both are eaten promifcuoufly.

f. Provençal Strawberry, or Majaufe. Fragaria bifera; Duchefne in Lam. Dict. n. 9. F. in alpibus Bargeis, bis in anno fructificans; Cæfalp. de Plant. 554. This is defcribed by Cæfalpinus, whom other authors have copied, as bearing fruit which is moderately compreffed and ftriated, with the tafte of a rafpberry. Duchefne procured plants in 1766 from the neighbourhood of Bargemon. In a wild ftate this kind produces fruit in the fpring and autumn, but almoft all the year round in a garden, which renders it very defirable for cultivation, efpecially as it lafts five or fix years without being frefh planted. The *fruit* is rather large, round, often flattened on the fhady fide, of a reddifh yellow, except where the fun colours it of a deep red. The part covered by the calyx remains whitifh, reprefenting a ftar at the bafe. It has a peculiar perfume.

g. Champagne Strawberry. Fragaria dubia; ibid. n. 10. "This variety," fays Duchefne, "which is found about Ferté-fous-Jouarre, upon little hills, not in woods, is much lefs robuft than the preceding. Its *fruit* is more flattened, higher coloured, and very vinous. It is difficult to diftinguifh this kind of Majaufe from the ftrawberries properly fo called (*F. vefca* and its varieties), and its exiftence leads us much to doubt of the diftinction of thefe two kinds from thofe. This Champagne Majaufe is lefs fruitful than that of Provence. It bears fewer flowers, and is moreover very fubject to incomplete, or even total, fterility. When raifed from feed, very few fertile individuals are produced, and there

were some sterile ones among those sent us from the country in 1767." These remarks render it doubtful to which distinct species of *Fragaria* the variety here described may belong, but respecting the last, the position of the calyx puts it out of doubt.

3. F. *virginiana.* Scarlet Strawberry. Mill. Dict. ed. 8. n. 2. Ehrh. Beitr. n. 3. Willd. Sp. Pl. v. 2. 1091. Duchesne 204. Lam. Dict. n. 24. (F. vesca δ; Ait. Hort. Kew. v. 2. 211. F. virginiana, fructu coccineo; Moris. v. 2. 186. F. glabra, fructu coccineo majore, seminibus in cortice loculoso altiùs depressis, virginiana; Duham. Arb. Fruit. v. 1. 181. t. 5.)—Calyx of the fruit spreading. Hairs of the leaf-stalks, and of all the flower-stalks, erect. Leaves nearly smooth on their upper surface.—Native of Virginia. *Clayton.* This in our gardens is one of the best known and most valuable kinds, on account of its plentiful bearing, hardiness, earliness, and grateful flavour, as well as the facility with which it is forced. The *leaves* are larger and smoother than those of *F. vesca.* *Flowers* less expanded, but more copious, forming a dense sort of corymbus, and each standing on an elongated slender stalk, whose hairs are erect, almost indeed close-pressed, as are all those likewise on the common flower-stalks and on the leaf-stalks, affording an excellent specific character. The peculiar scarlet colour of the *fruit* is well known. Its surface swells between the seeds, making little cells in which they are lodged. No white, nor any other variety of this species, except a slight variation in the internal redness of the fruit, is known in Europe. Linnæus seems to have been scarcely at all acquainted with the Scarlet Strawberry, not having mentioned it, even as a variety, except in his Hortus Cliffortianus. Duchesne complains that this Strawberry is too juicy and tender to bear carriage, or be brought to market, but we find no such difficulty in England, though it is certainly more tender than most others. Its perfume, when confined or over powerful, becomes intolerable to most people, and however grateful this fruit may be to persons in general, there are persons to whom one or two Scarlet Strawberries is an actual poison. The calyx enfolds the unripe fruit in this species, without touching it, but becomes subsequently expanded.

4. F. *elatior.* Hautboy Strawberry. Ehrh. Beitr. n. 2. Willd. Sp. Pl. v. 2. 1091. (F. moschata; Duchesne 145. moschata dioica; Lam. Dict. n. 18. F. vesca β, pratensis; Retz. Obs. fasc. 6. 30. F. fructu parvi pruni magnitudine; Bauh. Pin. 327. F. muricata; Mill. Dict. ed. 8. n. 3. F. et fraga; Lob. Ic. v. 1. 697. Dod. Pempt. 672. Ger. em. 997. f. 2. F. major et minor; Fuchs. Hist. 853. Fraga bohemica maxima; Park. Parad. 527. f. 7.)—Calyx of the fruit reflexed. Hairs of the leaf-stalks, and of all the flower-stalks, widely spreading, somewhat deflexed.—The native country of this fine species has been enveloped in great uncertainty. Miller declares it to be of American origin, which Ehrhart copies with a doubt. Some old authors reported that it came from Hungary and Bohemia, which we are disposed to believe, because so many of the early writers have figured this species and not the *F. vesca*; and we are assured by Mr. Dickson, Mr. Jackson, and Mr. Anderson, all excellent practical botanists, that it is certainly wild near Tring in Hertfordshire, on the west side of that town. Mr. W. Borrer also finds it in Charlton forest, Sussex. It may therefore be a native of other parts of Europe, though often overlooked for the Wood Strawberry, and not detected even by the indefatigable Ehrhart. No species of any genus can be better defined than this. The direction of the copious hairs on all the *flower-stalks*, both general and partial, as well as on the leaf-stalks, being widely spreading, or rather pointing downwards, affords a clear specific character, permanent in the dried as well as fresh specimens. The *calyx* of the fruit is short and reflexed, much like that of the Wood Strawberry. The whole *herb* is larger and stronger than in any of the foregoing species. Common *flower-stalks* tall, strong, mostly compressed. *Flowers* large, spreading, generally but not always imperfectly dioecious, the stamens being most effective on one plant, the pistils on another, so that the gardeners usually find it necessary to cultivate both sexes, and hence the produce of the same extent of ground is not so great as in the *F. vesca* or *virginiana.* This sexual difference was first observed by Duchesne, whom Linnæus cautioned against being misled by flowers rendered abortive by cold in the spring; but the former was correct. The *fruit* is large, roundish, of a dark dull crimson, with a high musky perfume, but less of acid pungency than either of these just mentioned, palling on the palate as that perfume gradually becomes less sensible, and a mawkish flavour succeeds. The flesh is solid, firmly fixed to the calyx, without any central cavity. Its surface is pitted, but less than in the Scarlet Strawberry. M. Duchesne remarks in his first publication, that this species is not subject to any remarkable varieties, but in Lamarck he mentions some slight ones; in which latter work he moreover corrects his former mistake, of making the Swedish *F. vesca pratensis* of Linnæus, (our *F. collina*) the same with the Hautboy, an error in which Ehrhart and Retzius have remained. The failure of the fruit of the Hautboy, which has been observed to dwindle away, seems owing to a neglect of the cultivation of the male plants, because they were observed not to bear fruit. Hence the females we e unfruitful for want of impregnation. The old wooden cuts above quoted clearly express the Hautboy Strawberry, and not the Wood or Scarlet, the hairs of the stalks, and their direction, being very faithfully delineated.—In the herbarium of Linnæus is a specimen of the species of which we are treating, without a name, but marked by himself as gathered at Lund in Scania. But unfortunately on the same paper is one of the Scarlet, so that we cannot presume the former to be wild, as the latter assuredly is not. They were perhaps sent him by Retzius, who has published a short remark, quoted above, on the dioecious nature of the Hautboy.

a. Royal Hautboy. Fragaria moschata; Duchesne in Lam. Dict. n. 17. Of this we know nothing but from the author here cited, who suspects it may be a hybrid production between the Hautboy and some variety of the *F. collina.* Of this he had met with another instance, in which a very delicious and juicy little strawberry was produced, but the plants soon became sterile. The present however proves luxuriant and prolific, bearing two crops in a year, of light-coloured firm fruit. The flowers are not dioecious in this variety.

5. F. *grandiflora.* Pine Strawberry. Ehrh. Beitr. n. 4. Willd. Sp. Pl. v. 2. 1092. (F. Ananassa; Duchesne, 190. Lam. Dict. n. 20? F. vesca ε; Ait. Hort. Kew. v. 2. 212. F. Foliis ovatis crenatis nervosis, calycibus maximis; Mill. Ic. 192. t. 288.)—Calyx of the fruit erect. Hairs of the leaf-stalks, and of the common flower-stalks, upright; those of the partial ones rather spreading. Leaves smooth above; their serratures ovate.—We cannot but think Duchesne's original account of this strawberry more correct than what he has given in Lamarck. He justly presumed it a native of Louisiana, rather than of Surinam, to which common report has attributed it. It is now not unusually cultivated near London. In habit this most agrees with the Hautboy; but in botanical characters, though not at all in habit or qualities, with the scarlet: and those characters are so specific,

cific, that we can by no means aſſent to the conjecture of its having originated in a garden at Harlem.

F. *grandiflora* is one of the largeſt kinds, vyeing in that reſpect with the Chili Strawberry, hereafter deſcribed, but differing from that in the greater ſmoothneſs of its herbage. The *leaves* are large, firm, obtuſe, with large, ovate, bluntiſh ſerratures, very unlike thoſe of the Scarlet, though like them they are nearly or quite ſmooth on their upper ſurface; beneath they are ſomewhat pale, and ſlightly hairy. The hairs on their *foot-ſtalks* are long, fine, and upright, not cloſe-preſſed; thoſe of the general *flower-ſtalks* are rather more inclined to ſpread, and thoſe of the partial ones even more ſo, but not in ſuch a degree as to become horizontal. The *flowers* are numerous, large and cymoſe, often having ſix petals, and a correſponding number of other parts. *Fruit* more like the Hautboy than the Scarlet, very large, of a pale red, approaching to fleſh-colour, firm, and adhering to the calyx, but hollow in the centre; its ſurface ſcarcely pitted, very highly poliſhed. The flavour is very fine, and, in our opinion, preferable to the Hautboy. It will readily be perceived by this deſcription how different this ſpecies is from the Green Strawberry, F. *collina*, with which it has in the name of Pine-Strawberry been ſometimes confounded.—The leaves are occaſionally variegated. The hue of the fruit varies a little, but is always of a more or leſs pale crimſon or purpliſh caſt, not verging towards ſcarlet.

a. Bath Strawberry. Fragaria calyculata; Ducheſne in Lam. Dict. n. 21. A rather ſtronger variety than the former with a large *calyx*, and rugged or pitted *fruit*. Ducheſne now quotes Miller's t. 288. under this variety. *b.* Mule Strawberry. Fragaria hybrida; ibid. n. 25. Suppoſed to have been produced between the Pine and the Scarlet. It is early, but a bad bearer.

6. F. *chiloenſis*. Chili Strawberry. Ehrh. Beitr. n. 5. Willd. Sp. Pl. v. 2. 1092. Ducheſne 165. Lam. Dict. n. 19. (F. veſca γ; Linn. Sp. Pl. 709. Ait. Hort. Kew. v. 2. 211. F. chiloenſis, fructu maximo, foliis carnoſis hirſutis; Dill. Elth. 145. t. 120.)—Calyx of the fruit erect. Hairs of the leaf-ſtalks, and of the common flower-ſtalks, deflexed; thoſe of the partial ones horizontal. Serratures of the leaves broader than long.—Native of Chili, where it is called by the Spaniards *Frutilla*, or little fruit. It was brought from that country to France in 1712, or 1716, by M. Frezier, and thence found its way into various European gardens. It flowered in that of Eltham in 1730, where Dillenius made his deſcription and very accurate figure, in which the peculiar direction of the pubeſcence, affording a certain ſpecific diſtinction, is faithfully expreſſed, as well as the true ſhape of the ſerratures of the leaves. This Strawberry is now one of the moſt common, immediately ſucceeding the Scarlet at our tables, and known by the name of Carolina Strawberry, rather than by its true appellation. Some gardeners have attempted to transfer the name of Hautboy to the preſent; that the true Hautboy, being leſs profitable, might become obſolete and be forgotten. The Chili Strawberry is as large in all its parts as any other kind, and rather larger in its *ſtalks* and *bloſſoms*. The *leaves* are of moderate dimenſions, but firm and ſomewhat rigid, veiny; almoſt ſmooth above, paler and very hairy beneath. Their ſerratures are broader, ſhorter, and more rounded than in any other ſpecies, ſo that they might almoſt be called crenate. The copious hairs of their *foot-ſtalks* are all directed ſtrongly downwards, and thoſe of the general *flower-ſtalks* are nearly equally ſo; but the more denſe hairs of the partial ſtalks project horizontally. The *flowers* are often luxuriant in the number of their parts. They appear by the report of Ducheſne to be ſometimes dioecious, but of this we never ſaw any ſigns, the varieties with which we are acquainted being good bearers. The *calyx* is cloſed after flowering, and embraces the ripe *fruit*, which is large, ovate, often compreſſed and abrupt, of a ſcarlet rather than crimſon hue, ſtudded with innumerable ſeeds; its inſide is ſpongy towards the middle, and uſually white. The flavour is gratefully acid, with rather leſs of perfume than the other kinds. Frezier ſays the fruit is ſometimes in Chili as big as a hen's egg. It is remarkable that this kind was ſo ſcarce in France, when Ducheſne publiſhed his book in 1766, though introduced fifty years before, that he tells us he had taſted only a very imperfect and abortive one.

a. Carolina Strawberry. Fragaria caroliniensis: Ducheſne, in Lam. Dict. n. 22. We perceive little in Ducheſne's deſcription, by which this can be diſtinguiſhed from the Chili; nor can we imagine why he has ranged the Pine and Bath Strawberries between them. What we have ſaid above of the Chili anſwers to this; for the ſlight differences which occur in every garden, as to the ſhape or colour of the fruit, are certainly very immaterial and tranſient.

b. Canterbury, or Red-fleſhed Strawberry. Fragaria tincta; ibid. n. 23. Differs from the laſt variety merely in the crimſon hue, with which the fruit is ſtained to the very centre.

Such are all the known ſpecies, and principal varieties of eatable Strawberries. We ſhall finiſh our hiſtory of the genus with one that is altogether unprofitable, as its name imports.

7. F. *ſterilis*. Barren Strawberry. Linn. Sp. Pl. 709. Curt. Lond. faſc. 3. t. 30. Engl. Bot. t. 1785. (F. minimè veſca, ſive ſterilis; Ger. em. 998.)—Stem decumbent. Flowering-branches weak, each bearing one or two flowers. Fruit juiceleſs.—Native of dry gravelly paſtures, throughout the middle and ſouthern parts of Europe; very common in England, flowering in March and April. This is a ſmaller plant than any of the foregoing, and eſſentially diſtinguiſhed from all of them by its decumbent *ſtem*, deſtitute of runners, and by the flowering branches bearing one or two leaves, and only one or two *flowers*. The *leaflets* are obovate, ſharply ſerrated, moſt ſilky beneath. The hairs on their *foot-ſtalks* ſpread horizontally, as do thoſe on the *flower-ſtalks*. The *flowers* are ſnow-white, ſmall and delicate, with a hairy *calyx*. *Receptacle* of the ſeeds ſmall and dry, ſcarcely deciduous as the generic character requires, yet it is preſent. *Seeds* ſmooth, or very ſlightly wrinkled.—Some difficulties attend the generic arrangement of this ſpecies, yet it has the preciſe habit and characters of a *Fragaria*, except the dry receptacle. In this laſt reſpect it agrees with *Potentilla*; and indeed Haller refers the whole of the latter genus, with *Tormentilla*, *Comarum*, and *Sibbaldia* of Linnæus, to *Fragaria*, as Ludwig, Boehmer, Scopoli, and Crantz have done. In this, nature is entirely ſacrificed. We preſume to think that the Linnæan genera, in this natural order of *roſaceæ*, are among the moſt natural and beſt defined of the whole ſyſtem.

In Mr. Andrews's Repoſitory, t. 479, is deſcribed and figured a plant from the north-eaſt part of Bengal, by the name of *Fragaria indica*. This was found on the Nepal mountains, by Dr. Buchanan, from whom we have it. The *ſtem* is creeping, like *Potentilla reptans*; *leaves* ternate; *flowers* axillary, ſolitary, ſtalked, with yellow petals, and a red pulpy *fruit*. The latter, neverthleſs, is totally different from a *Fragaria*, and is nearly, if not entirely, the fruit of a Rubus, being compoſed of ſeparate juicy grains, in each of which a ſeed is lodged. The *calyx*, however, being in ten ſegments, five larger and five ſmaller, as in *Fragaria* and *Potentilla*, differs eſſentially from that of a *Rubus*, from

from which alſo the habit is altogether diſſimilar. This plant, indeed, conſtitutes an entirely new genus, and we propoſe to call it *Ducheſnea fragiformis*, in memory of a writer who has thrown ſo much light on its near relation, *Fragaria*. S.

FRAGARIA, in *Gardening*, compriſes a plant of the low, herbaceous, perennial, hardy fruit kind.

Of which the ſpecies moſtly cultivated is the eſculent ſtrawberry (*F. veſca*), of which there are ſeveral varieties in cultivation, but the following are the principal.

The wood-ſtrawberry, which has the leaflets oval-lanceolate, acutely ſerrate; the petioles woolly; the runners ſlender, ſmooth, often tinged with purple; peduncles with two or more flowers. The fruit ſmall, and uſually red; it has commonly little flavour here, from the plants being too much ſhaded in the woods and hedges. The ſub-varieties of which are, the white wood-ſtrawberry, which ripens a little later in the ſeaſon, and is often preferred to it for its quick flavour; but as it ſeldom produces ſuch large crops of fruit as the red ſort, it is not ſo generally cultivated.

The alpine ſtrawberry, which is a larger plant than that which grows in woods, the ſtem higher, the leaves broader, the fruit larger, red, and uſually much pointed, ſometimes white. It is well flavoured, and the plants continue long in bearing, which renders them very valuable. The reaſon of this is, that the runners which it throws out during the ſummer ſhoot up into flower and fruit the ſame year more freely than in the other ſorts. It is ſometimes termed everlaſting ſtrawberry.

The rough-fruited, or prickly ſtrawberry, which Martyn thinks nothing but an accidental variety, has the flower greeniſh; the fruit harſh, rough and prickly, of a greeniſh colour, with ſome ſhow of redneſs.

The hautboy-ſtrawberry is very different from the reſt in leaf, flower, and fruit. The leaves are larger, thicker, hairyiſh, and rough. The fruit very large, and of a pale red colour. It varies with oval, fine-ſhaped, and green fruit; with red bloſſom, with white-ſtriped leaves, and with yellow-ſtriped leaves.

There is alſo an improved ſub-variety of it, called globe-hautboy; the fruit of which is larger, and of a globular form. Martyn has obſerved, that "where theſe are neglected, they degenerate to the common hautboy; but where the ſoil is good, and the culture well managed, the plant will produce a great quantity of large well-flavoured fruit."

But this variety of ſtrawberry is very apt to degenerate, and to produce only dry effete fruit; which, according to Monſ. Duhamel, is owing to there being two ſorts of plants, one bearing male, the other female, or rather imperfect hermaphrodite flowers; the former of which, being reputed uſeleſs, are carefully deſtroyed; hence not only the ſeeds become abortive, but the receptacle, commonly called the fruit, ſmall and juiceleſs. This Martyn thinks "may be remedied, either by planting a few of the male plants, or of the ſcarlet, or pine ſtrawberry, among the hautboys."

The Chili ſtrawberry has the leaves hairy, oval, and of a much thicker ſubſtance than any ſort yet known, and ſtands upon very ſtrong, hairy foot-ſtalks; the runners from the plants are very large, hairy, and extend to a great length, putting out plants at ſeveral diſtances. The peduncles are very ſtrong; the leaves of the calyx long and hairy. The flowers are large, and often deformed; and ſo is the fruit, which is very large. When cultivated in very ſtrong land, the plants produce plenty of firm, well-flavoured fruit; but as it is a bad bearer in moſt places, it has been lately leſs cultivated than formerly.

According to Frezier, the fruit uſually attains the ſize of a walnut, but is ſometimes as large as an egg, of a paler red than the European ſtrawberry, and not ſo quick in its flavour. It deſerves cultivation for the ſingularity and ſize of the fruit. And it varies with round pale red, with globular pale red, with oblong-oval pale red, and deep red fruit. There is alſo the Carolina, ſcarlet, and white-fruited; the royal large red; the large Dutch, Bath, and Devonſhire Chili ſtrawberry.

The ſcarlet ſtrawberry, which is the ſort firſt ripe. The fruit is good, being preferred to moſt others by many. It was brought from Virginia, where it grows naturally in the woods. It is very different from the wood ſtrawberry in leaf, flower, and fruit; the leaves being of a dark green, and of a more even ſurface, the flowering-ſtems ſhorter, the fruit being frequently concealed among the leaves; and it varies with roundiſh leaves and with ſtriped leaves.

The pine ſtrawberry, in which the leaves have a great reſemblance to thoſe of the ſcarlet ſtrawberry, but are larger, of a thicker ſubſtance, and the indentures of their edges blunter; the runners are much larger, and hairy; the peduncles are ſtronger; the flowers much larger; and the fruit approaches in ſize, ſhape, and colour, to the Chili ſtrawberry. It produces a great quantity of fine, large fruit, when the plants are kept clear from runners during the proper ſeaſon.

According to Monſ. Duhamel, it is raiſed from the ſeed of the Chili ſtrawberry. The flower is very large, and the fruit has ſomething of the ſmell and taſte of the pine-apple. It varies in the form of the fruit with ovoid, with oblate-ſpheroid, and with irregular fruit. It is much ſmaller than the Chili ſtrawberry. There are alſo the green, red, and hautboy-fruited, as well as the Chili pine-apple ſtrawberry.

The Carolina ſtrawberry, which greatly reſembles the above, but is much leſs in all its parts, and leſs hairy; the flower-ſtems are ſhorter; the flower-buds more lengthened out, and leſs ſwoln; the fruit ſmaller, more regular in the form, of a higher colour, but the perfume not ſo pleaſant. Martyn remarks, that the pine varies little when raiſed from ſeed, whereas this varies much in the flower, fruits, and other parts.

It is not improbable but that there may be many other varieties and ſub-varieties of this fruit which may be highly deſerving of cultivation.

The wood and alpine ſorts, in general, bear beſt when raiſed from ſeed, and planted in a rich light earth of a browniſh caſt. The ſcarlet, the hautboy, the Carolina, and the Chili, anſwer beſt on ſtrong mellow loams.

Method of Culture.—In order to raiſe this ſort of fruit to the greateſt advantage and perfection, the ſoil ſhould be of the friable loamy kind, with a moderate degree of moiſture, but by no means wet.

All the different varieties and ſub-varieties may be made uſe of where large ſupplies are wanted; but in other caſes, a few of the ſmall and large ſorts may be ſufficient. The ſame varieties ſhould always be planted together in ſeparate beds, or other places; but never any mixture of different ſorts admitted in the ſame ſituations.

The moſt uſual practice, in forming beds of this ſort of fruit, is by planting out the off-ſets taken from the ſides of the old plants, or ſuch as are formed from the rooting of the joints of the runners; but the former are, in general, the better plants. And in chooſing them, they ſhould never be taken from ſuch plants as are old, and which have been neglected in their culture, but conſtantly from ſuch as have been well kept in order, and are in a full bearing ſtate; ſuch

off-fets as ftand neareft to the old plants being preferred to fuch plants as are formed by the trailing ftems at a diftance: Upon a careful attention to thefe circumftances, much of the fuccefs of this fort of culture depends. In fome of the varieties, as thofe of the wood kind, the off-fets are beft when taken from the wild bearing plants; as they are not fo liable to run as thofe taken from the cultivated forts.

Thefe off-fets or plants are moftly of fufficiently ftrong growth the firft year for being made ufe of; but when this is not the cafe, they may be fet out in nurfery-rows till they have obtained a full growth, and are in the moft proper ftate for being fet out.

In preparing for plantations of this fort, the ground fhould be well trenched over, and effectually cleared from all forts of weeds, and, after being laid quite level, formed into beds four feet in width, with paths of two feet or two feet and a half between them, for the convenience of cultivation and gathering the produce. The fituation fhould be quite open, and have as much as poffible a fouthern afpect. It is likewife a great advantage when the beds can be formed in a fhelving or floping manner towards the fouth, fo as to have the full influence of the fun during the day.

When the beds have been thus made up, they are in a proper ftate for being planted upon, which fhould be done as foon as poffible.

The moft fuitable time for performing this bufinefs is in the early autumn, as about the latter end of September, or beginning of the following month, in order that the plants may be well rooted before the commencement of the winter frofts. Some, however, plant in the early fpring; but there is more danger of the plants being deftroyed by the heat of the fummer at this feafon.

In executing the work, the plants or off-fets fhould be put in by means of a line and dibble, in rows lengthways of the beds, at different diftances, according to the kinds.

The moft ufual diftances are, for the wood fort, twelve or fifteen inches each way; and eighteen inches for the fcarlets, hautboys, Chili, alpine, and other large kinds. Much advantage is always gained by letting them have fufficient room. It is ufual to fet them out in the quincunx order; and great care fhould be taken, in the work of planting, to clofe the mould well to the roots of the plants, as they are fet out. When the whole has been done, they fhould have a good watering, to fettle the earth well about their roots, and keep them fteady in the ground.

But befides this mode of planting upon beds, they fucceed well on the fronts of clumps, borders, and other parts of pleafure-grounds, efpecially when fet fo as to have a due degree of fun, and without being too much fhaded by the trees and fhrubs.

When new varieties of this fort of fruit are wanted, the propagation muft be effected by fowing the feed produced on the fruit, when perfectly ripened, either in the fpring or autumnal feafon, on a bed of light earth, or in pots placed in the fhade.

After the plants have been fet out as above, and taken new root, care is neceffary, if the winter prove fevere, to lay fome old tanner's bark over the furface of the bed between the plants, to keep out the froft. This is abfolutely neceffary in the Chili fort, as the plants are frequently killed in hard winters, when expofed without any covering. Where tanner's bark cannot be eafily procured, faw-duft or fea-coal afhes may be ufed, or even decayed leaves of trees, or the branches of ever-green trees, with their leaves upon them, laid over the beds, or other parts.

And in the following fummer, the plants fhould be conftantly kept clean from weeds, and all the runners be pulled off as faft as they are produced: as, where this is conftantly practifed, the plants become very ftrong by the following autumn; but when neglected, and the runners are permitted to ftand during the fummer, and then pulled off in the autumn, they are not half fo ftrong, nor will there be near the fame quantity of fruit upon them the following fpring, or fo large and fine. Where proper care is taken of the plants the firft fummer, there is generally a plentiful fupply of fruit the fecond fpring after planting.

When the plants are in bloffom, if the weather prove dry, good waterings, given occafionally, prove very beneficial in promoting a plentiful production of fruit; but, in other cafes, it is unneceffary to be had recourfe to.

But in the general culture of this fort of fruit, as the old plants are thofe which produce the fruit, the fuckers feldom affording any till of a full year's growth, it is obvioufly neceffary to diveft them of them; as, when fuffered to remain, they rob the fruitful plants of their nourifhment, in proportion to their number; and befides, the fuckers render each other weak, and thus caufe barrennefs. In the alpine forts, the fummer runners fhould not, however, be removed, as they produce fruit.

After having been thus cut and managed in the fummer feafon, it will be neceffary, in autumn, not only again to diveft them of thefe ftrings or runners, but of all the decayed leaves, and to clear the beds from weeds; then the paths fhould be dug up, and the weeds buried, fome earth being laid over the furface of the beds between the plants, which will ftrengthen them, and prepare them for the following fpring; and if, after this, there be fome old tanner's bark laid over the furface of the ground between the plants, it will be of great fervice to them. In the fpring, when the danger of hard froft is over, as in March, the ground between the plants in the beds fhould be forked over with a narrow three-pronged fork, to loofen it and break the clods; and in this operation the tan, which was laid over the furface of the ground in autumn, will be buried, and be a good dreffing to the ftrawberries, efpecially in ftrong land. This fhould be done whether the plants are in diftinct bunches or in large beds, being equally neceffary in all cafes.

And about the beginning of April, Martyn has obferved, "if the furface of the beds be covered with mofs, it will keep the ground moift, and prevent the drying winds from penetrating the ground, and thereby fecure a good crop of fruit, and alfo preferve the fruit clean, that when heavy rains fall after it is full grown, there will be no dirt wafhed over them, which frequently happens, fo that it muft be wafhed before it is fit for the table, which greatly diminifhes its flavour."

It is of great utility in dry feafons to water occafionally every fummer, while the plants are in blow and forming their fruit; but as it approaches maturity, this fhould be left off, as it injures the flavour of the fruit.

But in fome of the more fine forts, or curious large varieties, when ripening, it is eligible either to tie up the ftalks with the bunches of fruit thereon to fticks, or the leaves and ftalks together; fo as, in either way, to elevate the fruit from the earth, more out of danger of rotting by wet, if a rainy feafon, and to more effectually enjoy the full fun to ripen with a good flavour; or, fometimes place flat tiles on the ground, round each plant of a few particular forts, for the fruit to reft upon, drier, and more fecure from rotting by the damp of the earth, and to ripen with an improved flavour by fuch means.

As the fruit ripens in June and the following months, it fhould be gathered daily; being plucked off in the cup, with about half an inch of the ftalk adhering, by which

means they are not fo liable to be bruifed, and appear more conveniently when ferved at table, and are more agreeably picked up out of the difh or bafket for eating. The wood ftrawberries are, however, very commonly gathered without any ftalky part, being generally picked clean out of their cups, efpecially when defigned to eat with cream, &c.

Method of Culture in Hot-houfes, &c.—Befides the above method of raifing this fort of fruit in the natural ground, it may be brought to perfection at a much earlier period, by forcing in hot-houfes, glafs-frames, againft hot walls, and under common dung or bark hot-bed frames, &c.; but they fucceed beft in the fucceffion pine-apple houfe.

The forts moft fuitable in this intention are the different fmaller forts, as the fcarlet, the alpine, and the wood ftrawberry. The hautboy grows too large for this purpofe.

In providing fets, great care fhould be taken to have them from the moft fruitful plants, and thofe which grow immediately on the old plants; they fhould be taken off in autumn, and each planted in a feparate fmall pot filled with loamy earth, being placed in a fhady fituation till they have taken root; after which they may be removed to an open fituation till the middle or end of November, when the pots fhould be plunged into the ground up to their rims, to prevent the froft from penetrating through the fides. When placed near a wall, pale, or hedge-fence, expofed to the eaft or north-eaft, they fucceed better than in a warm fituation, as they are not forced too forward; after this they only require to be fecured againft froft.

In the fpring following the plants will have filled the pots with their roots by the end of April, when they fhould be turned out of them and their roots pared, and re-planted into penny pots filled with the like loamy foil, and re-plunged into the ground, in a fhady fituation, to remain till the following fummer; during which time they muft be kept clean from weeds, and have all the runners taken off as faft as they are produced. And if there fhould be any flowers produced, they fhould be pinched off, in order to have the plants as ftrong as poffible.

Towards the end of October, or earlier, if the feafon prove cold, the pots fhould be removed into a warmer fituation, to prepare them for forcing; as they fhould not be fuddenly removed from a very cold fituation into the ftove or hot-bed, but be gradually prepared for it. Where they are defigned for the borders near hot walls, they may then be turned out of the pots and planted, that they may have time to get frefh rooted before the fires are made to heat the walls; and they may be placed very clofe to each other, as they are defigned to remain there only till they have ripened their fruit. It is always the beft way to pot the plants a year before they are forced.

When the fires are lighted about the latter end of December the ftrawberries in the borders will be ripe the end of March; but if the feafon fhould prove very cold, it will be the middle of April before they are fit for the table.

When intended to be forced in a pine-apple ftove, and there is not room to plunge them in the tan-bed, the plants fhould be tranfplanted into larger pots in September, that they may be well rooted before they are removed into the ftove, which fhould not be till December, or later.

If placed under a frame the beginning of November, to be fcreened from froft, it will prepare the plants better for forcing. And where wanted early, a hot-bed fhould be made under the frames, upon which the plants are put in the latter end of October, by which they are brought forward to flower, and then removed into the ftove, being placed as near to the glaffes as poffible, to have the full influence of the fun and air; as when placed to the back the plants draw up weak, and the flowers drop without producing fruit.

In the management of the plants in the firft mode there muft be care taken to fupply them with water when they begin to fhew their flowers, otherwife they will fall off without producing fruit; and, in mild weather, frefh air fhould be admitted to them every day. And in the ftove method, as the earth in the pots will dry pretty faft when they ftand upon the pavement of the hot-houfe, or on fhelves, they muft be duly watered; but not too much given at a time, which would hurt them.

Where properly managed, they produce ripe fruit in February, or the beginning of the following month.

When the fruit has been wholly gathered from the plants, they fhould be put out of the ftove, and from the borders near the hot wall, that they may not rob the fruit-trees of their nourifhment and fupport.

There is another method of ripening this fruit early, which is on hot-beds, where there is not the above conveniences. The plants are prepared in pots in the above manner, and placed in a warm fituation in the beginning of October; about December the hot-bed is made in the fame manner as for cucumbers, but not fo ftrong; and when the firft violent fteam is over, fome old rotten dung, or, what is better, neat's dung, laid over the hot-bed to keep down the heat. The plants fhould then be plunged in the pots into the bed, as clofe together as poffible, filling up the interftices between them with earth. They muft afterwards have air admitted to them every day; and, if the heat of the bed is too great, be raifed up to prevent their roots being fcorched. But when too cold, the fides of it fhould be lined with fome hot dung. This bed brings them to flower by the end of February, or the beginning of March, when another mild hot-bed muft be prepared to receive them. Upon the hot dung fome neat's dung, about two inches thick, being fpread equally, to prevent the heat from injuring the roots of the plants, and upon this two inches of a loamy mould; when this has lain two days to warm, the plants fhould be taken out of the firft hot-bed and turned carefully out of the pots, preferving all the earth to their roots, and placed clofe together upon this new hot-bed, filling up the vacuities between the balls with loamy earth: the roots of the plants foon ftrike out into the frefh earth, which ftrengthens their flowers, and caufes the fruit to fet in plenty; proper care fhould then be taken to admit frefh air to the plants, and fupply them perfectly with water, that they may produce ripe fruit in April, or before.

By thefe means a fucceffion of this fruit may be obtained from March, April, or even earlier; and in the open air, from June to October and November, fhould the weather prove mild; for not only the alpine, but the white wood ftrawberry will continue bearing in tolerable abundance until the autumn frofts come on, efpecially in warm fituations, and foils not too light.

The heat required in bringing ftrawberries forward at an early period is fuch as is fufficient for forcing the cherry and the peach.

In order to have new varieties of the ftrawberry, feed muft be employed. To obtain thefe, the ripe berries fhould be put into a veffel of water, and the pulp broken and rubbed with the hand, fo that it may be diffufed in the water and wafhed completely away, leaving the feeds behind. They fhould then be gradually dried, when they may be fown in the fpring on a border of rich, light earth, keeping them watered and free from weeds during the fummer feafon." See Strawberry.

FRAGILITAS Ossium, in *Surgery*, is a very remarkable

able diftemper of the bones, which become fo brittle as to be broken by exceedingly flight caufes.

The commonly received opinion is, that the fragilitas offium arifes from a deficiency of the animal matter of the bones affected, while the difeafe, named *mollities*, is owing to a defective quantity of the lime which naturally enters into the texture of thofe parts of the body. This idea feems to be confirmed by feveral inconteftible facts. Firft, it is well known, that if we take a recent bone and burn it in a ftrong fire, all the animal matter will be deftroyed, leaving the earthy texture alone, which, in this calcined ftate, is exceedingly brittle. Secondly, every one, at all acquainted with ofteology, is aware that the bones of children have a large proportion of organized animal fubftance in their ftructure, that fuch young bones are peculiarly flexible, elaftic, and difficultly broken. Thirdly, in old perfons the earthy part of the bones is very abundant, and the animal matter diminifhed; confequently, fuch bones are much more brittle and eafily fractured than thofe of young fubjects.

From the few remarks already made, it appears that a certain degree of fragilitas offium is a natural attendant on old age. However, it is not this flighter form of the affection, as feen in all old perfons, that we particularly wifh to treat of in the prefent article. Neither is it our intention to tire the reader with a ferious refutation of the doctrine, that the bones are always more brittle in frofty weather. The increafed number of fractures which happen in winter time are fully accounted for by the frequently flippery ftate of the ftreets and roads at this feafon of the year, and the confequently greater number of falls.

The diforder known by the appellation of fragilitas offium has been taken notice of by feveral authors, and fome very ftriking examples of the difeafe are recorded. Fabricius Hildanus, in his Cent. 2. mentions an inftance of a gouty man, fixty years of age, whofe bones were fo brittle that the arm and fore-arm were fractured by the patient endeavouring to put on one of his gloves. The fame writer alfo, in the fixty-eighth obfervation of his fecond Cent. fpeaks of a woman who broke fome of her bones in merely trying on a new fhoe. Nicholas Fontano likewife furnifhes us with the hiftory of a man whofe bones ufed to break even when handled in a very gentle manner. Rœderer, in a differtation, "De Offium Vitiis," mentions a woman who died of a fevere attack of the gout, and all whofe bones were exceedingly light, brittle, and even friable, "univerfali quafi carie exefa, fimilia offium calcinatorum, vel acido quodam liquore imbutorum." Although the middle parts of the cylindrical bones had no appearance of caries, yet they were of a light, loofe, thin texture, which was dry and eafily crumbled. The metacarpal and metatarfal bones, as well as thofe of the fingers and toes, were fo attenuated as to be tranfparent. Saviard and M. Louis cite inftances of the fragilitas offium in perfons who had long laboured under cancerous difeafes. The laft author quotes an example of a nun who broke her arm in fimply leaning on her fervant. A patient is defcribed in the London Medical Journal, who could not turn in bed without breaking fome bone or another.

The latter ftage of fyphilis is faid to be fometimes accompanied with this afflicting diftemper of the bones. The fragilitas offium is alfo fet down by authors as an occafional attendant on the fcurvy.

With regard to the treatment of this peculiar affection little can be faid, becaufe, at prefent, little is known. We may fay, indeed, that when the diftemper originates independently of any other obvious difeafe, no plan of cure is known. Some practitioners have thought that it would be rational to try the effect of the muriatic acid, adminiftered internally, or of any other acid which has the power of diffolving the phofphate of lime. This method appears plaufible, fuppofing the theory of the difeafe to be correct, and that the brittle ftate of the bones is owing to the redundance of earth in their texture. However, experience has hitherto exhibited no facts in favour of fuch treatment. Indeed, doubts may be entertained whether the fragilitas offium always depends upon the increafed quantity of earth, and the diminifhed proportion of animal matter in the ftructure of the bones which are affected. The difeafe may fometimes be owing to this alteration of texture; but it appears that the diftemper called *mollities offium*, and which is imputed to a deficiency of lime in the bones, is, at a certain unadvanced period of the difeafe, accompanied with the fragilitas. Mr. Gooch has related a cafe which fhews this circumftance, and he has adverted to fome other inftances of a fimilar nature. (Chirurgical Works, vol. ii. p. 393. edit. 1792.) The example mentioned by Rœderer, and quoted by us above, was attended with a remarkable lightnefs of the bones, which, therefore, in all probability, did not contain a due proportion of the phofphate of lime.

When fragilitas offium arifes from any pre-exifting difeafe, fuch as the fcurvy, old cancers, &c. it is obvious that if any hopes of relief can be indulged, they can only be realized by curing the primary affection.

FRAGMENS, Fr. anfwers nearly to *Pafticcio*, Italian, in *Mufic*; it is a collection of airs from different ballets, brought together without the leaft connection, but which, with dancing and finging between the acts, fupply an evening's entertainment as long as a regular opera. The pafticcios of the Italians have been much condemned by opera critics for the liberties taken with the drama, by fubftituting airs that have no connection with the recitative; but the fable of a regular drama is ftill preferved. The airs in Metaftafio's dramas are only recapitulations and illuftrations of the bufinefs of the preceding fcene, which would be complete without the air; fo that if the interpolated air is a good one, and well fung, it makes fome amends for its want of connection with the drama. But to put into action fragments of different dramas without any plot to intereft the audience, feems no lefs abfurd than it would be to make the performers of a mifcellaneous concert mount the ftage, and enact all their folos, fonatas, and concertos; and Rouffeau truly fays, that none but a man totally devoid of tafte could have fuggefted fuch a performance, or none but a cold and infipid audience fupport it.

FRAGOA De St. Pedro, in *Geography*, a town of Portugal, in the province of Beira; 13 miles S.S.W. of Lamago.

FRAGOAS, a town of Portugal, in Eftremadura; fix miles N.W. of Santeren.

FRAGUIER, Claude François, l'Abbé, in *Biography*, born at Paris 1666, was the fon of a captain in the regiment of guards, defcended from an ancient noble family. His love for the Greek language rendered him fo ftudious, that he acquired in it a knowledge fo profound as to procure him a place in the Academy of Belles Lettres in 1705, and, in 1707, admiffion into the French academy. This learned academician was unable to perfuade himfelf that antiquity, fo enlightened, and fo ingenious in the cultivation of the fine arts, could have been ignorant of the union of different parts, in their concerts of voices and inftruments, which he calls "the moft perfect and fublime part of mufic;" and thinking that he had happily difcovered, in a paffage of Plato, an indubitable and decifive proof of the ancients having poffeffed the art of counterpoint, he drew up his opinion into the form of a memoir, and prefented it to the Academy of Infcriptions and Belles Lettres, in 1710. M. Burette acquaints us that this abbé learned to play on the harpfichord at an advanced

vanced age, and concluding that the ancients, to whom he generously gave all good things, could not do without counterpoint, made them a present of that harmony, with which his aged ears were so pleased.

The passage in question is in the seventh book of Laws, in which Plato determines that the proper time for young persons to learn music is from thirteen to sixteen years of age; during which period he supposed they might be enabled to sing in unison with the lyre, and to distinguish good music from bad; that is, such airs as were grave, decorous, and likely to inspire virtue, from those that were of a light and vicious cast. This is speaking like a legislator, says the abbé Fraguier. But as harmonic composition was very bewitching to minds so remarkable for sensibility as the Greeks, and was, besides, of so difficult a study, as to require infinite time and labour to accomplish, he thought it necessary to caution them against too strong an attachment to it, and therefore established a kind of rule, by which they would be prevented from giving that time to musical studies, which might be better employed in more important concerns.

This is but the introduction to the passage in question, which is the following: "As to the difference and variety in the accompaniment of the lyre, in which the strings produce one air, while the melody composed by the poet produces another, (the poet then set his own verses,) whence results the assemblage of dense and rare, of quick and slow, acute and grave, as well as of *concord* and *discord*. Though the abbé Fraguier translates ἀντίφωνον, *dissonance*, it is not the true acceptation of the word, nor can it be found thus explained in any lexicon, or Greek writer on music; its precise and technical meaning will be given farther on. Besides, the knowing how to adjust the rhythm, or measure, to all the sounds of the lyre: these are not studies fit for youth, to whom three years only are allowed for learning merely what may be of future use to them. Such contrarieties of different difficulties in the study and practice of music, are too embarrassing, and may render young minds less fit for sciences, which they ought to learn with facility."

It does not seem necessary here to enter into a verbal criticism of this passage, as it has been understood and translated by the abbé Fraguier; nor to insert two other passages, one from Cicero, and one from Macrobius, which this author has given by way of corollaries, in support of his explanation of the passage in Plato; as we shall consign him and his fancied proofs in favour of ancient counterpoint to his brother academician M. Burette, the most able writer, in many particulars, of all those who have interested themselves in the dispute concerning ancient music. See BURETTE. The ingenious opponent of the abbé Fraguier proves that the famous passage in Plato upon which so much stress has been laid, implies no more than a concert of voices and instruments in unison and octaves, like plain-chant in the Romish church. He proves also that Plato determines the word harmony to mean no more than a melody in which the grave and acute sounds are mixed in succession, according to the regulation of the musical scale; and adds that Aristotle proves by questions in his Problems that the Greeks knew no other harmony, in our sense of the word, than unisons and octaves, when he asks: 1. Why a monody (a single voice) is more agreeable than when accompanied by a lyre or a flute, though these instruments are in tune, and form the same sounds as the voice? 2dly. Why a single instrument gives more pleasure than the union or concert of many instruments performing in unisons and octaves? 3dly. Why are unisons and octaves the *only accompaniments* that can be suffered in concerts, and why are the 4th and 5th, though qualified with the name of perfect concords, excluded?

The abbé Fraguier was not convinced, but as firmly adhered to his original opinion as many others have done, and still do, though supported with less learning; so that their obstinacy is one degree less blameable. It seems as if the rooted prejudices of wise men were harder to eradicate than those of ignorance and imbecility. It is well known that Fontenelle's attachment to Cartesianism was never shaken; for after the doctrine of Newton had been established throughout Europe, he published his "Théorie des Tourbillons Cartesiens," at the age of near a hundred. The abbé Fraguier died in 1728.

FRAIGHT, or FREIGHT, in *Navigation* and *Commerce*, the hire of a ship, or of a part of it, for the conveyance and carriage of goods from one port or place to another; or, the sum agreed on between the owner and the merchant, for the hire and use of a vessel.

The word is formed of the French *fret*, signifying the same thing; or from *fret*, or *fretum*, an arm of the sea: though others chuse to derive it from the German *fracht*, or the Flemish *vracht*, signifying *carriage*.

The fraight of a vessel is usually agreed on either at the rate of so much for the voyage, or by the month, or per ton, or other weight, or measure. The burthen of the ship is generally mentioned in the contract, *e.g.* 300 tons or thereabouts; and the number mentioned should not exceed the exact measure above five tons. If a certain sum be agreed on for the fraight of the ship, it must all be paid, although the ship, when measured, should prove less, unless the burthen be warranted. If the ship be fraighted for transporting cattle or slaves at so much a head, and some of them die on the passage, fraight is only due for such as are delivered alive; if for lading them, it is due for all that are put on board.

The principal laws and rules relating to fraighting are, that if a whole vessel be hired, and the merchant, or person who hires it, do not give it its full load, or burthen, the master of the vessel cannot, without his consent, take in any other goods, without accounting to him for fraight.

That, though the merchant do not load the full quantity of goods agreed on in the charter-party, yet he shall pay the whole fraight; and if he load more, he shall pay for the excess.

If a time be appointed by charter-party, and either the ship be not ready to take in, or the merchant to put on board, the parties are at liberty, with remedy by action for the detriment.

If part be on board, and some misfortune prevent the merchant's sending the whole in time, the master may contract with another, and have fraight as damage for the time they were on board longer than limited.

On the other hand, if the vessel is not ready, the merchant may ship the remainder of his goods aboard another, and recover damages against the first master or owners: therefore, by the law marine, chance, or other notorious necessity, will excuse the master, but he loses his fraight till he breaks ground. But if the merchant be in fault, he must answer the damage, or be liable to maintain the crew ten days; and, if after that, the full fraight; if damage afterwards, it is the merchant's risk: but by the common law, while the goods are on board, the master must see them forth-coming.

If goods are fully laded, and the ship hath broke ground, but the merchant afterward declines the adventure, and unlades again, by the law marine the fraight is due: but if he unload before the ship has actually sailed, he will in such case be only responsible for damages.

If an embargo be laid on the ship before she sails, the charter-party is dissolved, and the merchant pays the expence-

pence of loading and unloading; but if the embargo be only for a short limited time, the voyage shall be performed when it expires; and neither party is liable for damages.

If a set time be agreed on between the merchant and master, to begin and end the voyage, it may not be altered by the supercargo, without special commission: and if a master shall sail on his voyage, after the time agreed on for his departure, and damage happens afterwards, he shall make it good. If a ship be fraighted from one port to another, thence to a third, &c. and so home to the port whence she first sailed (commonly called a trading voyage), the whole is one and the same voyage, if performed according to the charter-party. If the ship be fraighted out and in, no fraight is due till the voyage is performed; if, therefore, the ship perish coming home, the whole fraight is lost. If a certain sum be specified for the homeward voyage, it is due, although the correspondent abroad have no goods to send home.

The master may set ashore such goods as he finds in his vessel, which were not notified to him; or take them at a higher rate than was agreed on for the rest. But if the master fraight his ship, and afterwards secretly take in other goods, he loses his fraight; and if any of the fraighter's goods should, for the ship's safety, be cast overboard, the rest shall not be subject to average, but the master must make it good. (See AVERAGE.) If the master transfer the goods from his own ship to another, without necessity, and they perish, he is responsible for the full value, and all charges; but if his own ship be in imminent danger, the goods may be put on board another ship at the risk of the owner.

If a ship be stopped or detained in its course, either through the master's or the merchant's default, the delinquent shall be accountable to the other. Thus, if the fraighter load the ship with prohibited goods, he shall answer the fraight contracted: but if the ship put into any other port than she is fraighted to, without necessity, the master shall answer damage to the merchant; but if forced in by storm, enemy, or pirates, he must then sail to the stipulated port at his own costs.

If the master be obliged to refit his vessel during the voyage, the merchant shall wait, or else pay the whole fraight: if the vessel could not be refitted, the master is obliged to hire another immediately, otherwise only to be paid his fraight in proportion to the part of the voyage performed; though, in case the merchant prove that the vessel, at the time it set sail, was not capable of the voyage, the master must lose his fraight, and account for damages to the merchant.

Fraight shall be paid for merchandizes which the master was obliged to sell for victuals, or refitting, or other necessary occasions, paying for the goods at the rate the rest were sold at, where they were landed.

In case of a prohibition of commerce with the country whither the vessel is bound, so that it is obliged to be brought back again, the master shall only be paid fraight for going.

And if a ship be stopped or detained in its voyage, by an embargo by order of the prince, there shall neither be any fraight paid for the time of the detention, in case it be hired per month; nor shall the fraight be increased, if hired for the voyage; but the pay and the victuals of the sailors, during the detention, shall be deemed average.

The master shall take no fraight for any goods lost by shipwreck, plundered by pirates, or taken by the enemy, unless the ship and goods be redeemed; in which case he shall be paid his fraight to the place where he was taken, upon contributing to the redemption. If part of the goods be thrown overboard, or taken by the enemy, the part delivered pays fraight.

The master shall be paid his fraight for the goods saved from shipwreck; and in case he cannot get a vessel to carry them unto the place where they were bound, he shall be paid in proportion to the part of the voyage already gone. The ship's lading, in construction of law, is tacitly obliged for the fraight; this being, in point of payment, preferred before any other debts to which the goods laden are liable, though such were precedent to the fraight, because the goods remain, as it were, bailed for the same.

The master may not detain any merchandize in his vessel, in default of payment of fraight; though he may order them to be seized any time, or any where, afterwards. If the goods be damaged without fault of the ship or master, the owner is not obliged to receive them, and pay the fraight, but he must either receive or abandon the whole; he cannot receive those that are not damaged, and reject the others. If the goods be damaged through the insufficiency of the ship, the master is liable for the same; but if it be owing to stress of weather, he is not accountable. It is the general custom for masters, on their arrival, to enter their protest, and in case, on discharge of the ship, any damage should appear on the loading, to extend the same; but this protest must be supported by evidence of collateral circumstances.

The master is accountable for all the goods received on board by himself and mariners, unless they perish by the act of God, or the king's enemies.

The master is not liable for carriage of liquors, nor accountable for contents of packages, unless packed in their presence. See INSURANCE.

FRAIGHT is also used for the burthen, or lading of a ship, or the cargo of goods, &c. which she has on board.

FRAIL, in *Rural Economy*, a name sometimes given to a sort of flat basket constructed of a strong coarse sort of rush or flag. It is often likewise called a flag basket.

FRAIL-*basket*, a term signifying the same sort of basket, and also that which is employed in packing up figs, raisins, &c.

FRAILS, in *Geography*, rocks on the south coast of the county of Wexford, in Ireland; 12 miles S.W. from Carnsore point.

FRAIN, or WRANOW, a town of Moravia, in the circle of Znaym, with a citadel; 12 miles W. N. W. of Znaym.

FRAISE, in *Fortification*, a kind of pallisade, or stake, placed horizontally in the exterior face of such ramparts as have only half revetements, for the purpose of preventing the assailants from ascending. When only one row of fraises is used, it is usual to fix them on a level with the terre-plein, *i. e.* on a level with the internal area of the place. Should there be no revetement whatever, a second row of fraises will be requisite, at about nine feet from the bottom of the ditch, so as to be above that height to which a man standing on the shoulders of another could easily climb.

Fraises should be about ten feet in length, of which nearly half should be buried in the rampart; otherwise they may, when the soil is not very firm, or when they are partially decayed, be wrenched out of their places, by means of ropes passed over their points. The distance between the fraises should never exceed five inches, but four are better; and they should be supported at every six feet by very stout posts let into the rampart, full six feet or more, if the soil demand it. Two stout rails should be laid from one post to another, not mortising into, but lying upon them, so as to overlap. By these means they will not be so subject to rot.

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The fraiſes ought to be of a triangular form, ſix inches wide on the flat or under ſide which lies upon the rails, and four inches thick between that flat ſide and the angle that lies uppermoſt. After being firmly nailed down in their places, the whole ſhould be ſmeared with tar, which, while hot, ſhould be ſprinkled with ſand paſſed through a fine ſieve; this will cauſe them to reſiſt moiſture, and to remain well coated during the hotteſt weather, provided care be taken to fill up all the chinks at the joints and over-laps in a proper manner.

Fraiſes add conſiderably to the ſecurity of entrenchments, &c. far more than palliſades, which, being erect, offer the chance of muſket balls paſſing through, and are ſubject to be deſtroyed by heavy ſhot; fraiſes are, by their ſituation, ſecure from the ordinary range of artillery, and oppoſe an abrupt obſtacle, ſuch as can be ſurmounted by eſcalade only, an operation attended with imminent danger in every ſituation, but eſpecially where the ladders are, as in this caſe, kept off from contact with the ramparts, ſo as to place the party in a poſition to be flanked, as well as to be oppoſed directly in front.

FRAISED Rails are now much uſed as defences againſt the encroachments of cattle by gentlemen who object to having ſtanding rails within view of their ſitting rooms, &c. Theſe are placed about two or three feet below the level of the field, in the interior bank of the ditch or hollow in which they are to ſerve as a boundary. In ſuch caſe they ought to have a very ſlight inclination upwards, juſt ſufficient to throw off moiſture. When intended to keep out horſes and horned cattle, they may be made of three rails attached at every eight feet to proper poſts; but, in contradiſtinction to military fraiſes, the rails ought to be fixed beneath, inſtead of reſting upon the rails, as in the former mode they are capable of greater reſiſtance to ſuch animals as might endeavour to force their way. The firſt rail ſhould be placed at ten inches from the bank, and be about four inches ſquare; the ſecond rail ſhould be fifteen inches from the other, centre from centre, and the third rail ſhould be eighteen inches, in like manner, from the ſecond. If ſheep, pigs, &c. are to be kept out, there muſt be a ſet of lath-fraiſes nailed below the rails, each about two inches wide and an inch and a half thick; theſe ought to ſtand at ſix inches from centre to centre, and have their butts within an inch of the bank. They ſhould reſt only on the firſt and ſecond rails generally, having their points projecting about ſix inches beyond the latter; but every third fraiſe ſhould be long enough to paſs over the third or outer rail, and to project its point ſix inches. This is an expenſive, but a very excellent defence, far ſuperior to upright pales; againſt which cattle are very fond of rubbing; they are beſides unſightly and far eaſier to paſs than a fraiſed rail. Where the bank is not ſufficiently ſteep, and it is deſirable to conceal the fence, it ſhould be placed ſomewhat lower down, and make an angle of about 25 or 30 degrees of elevation from the horizon. If the acclivity is great, for inſtance not more than 30 degrees from perpendicular, leſs protruſion may anſwer; therefore the third or outer rail may be omitted; or, if all three be preſerved, they may be laid rather nearer than the diſtances above given. There ſhould be at leaſt two feet of each poſt ſunk in the bank, but three feet will prove far more ſubſtantial.

FRAISING *of a Battalion*, is the lining it all round with pikes, in caſe of being charged by a body of horſe.

FRAIZE, or Fraise, in *Geography*, a town of France, in the department of the Voſges, and chief place of a canton in the diſtrict of St. Diè, ſix miles S. of St. Diè. The place contains 1678, and the canton 10,088 inhabitants, on a territory of 212½ kiliometres in 10 communes.

FRAMBŒSIA, in *Medicine*, from the French *framboiſe*, a *raſpberry*, a term applied by the noſologiſts to a diſeaſe, endemic in Africa, and thence tranſmitted to the Weſt Indies with the negro ſlaves, and called by them the *yaws*; the term *yaw*, in their language, being ſaid alſo to ſignify a *raſpberry*. Theſe terms have been applied to this contagious diſeaſe, in conſequence of the appearance of elevated fungous tumours, reſembling that fruit, on various parts of the ſkin, forming one of the moſt characteriſtic ſymptoms of the malady. In many other reſpects it reſembles the leproſy of the Jews, as deſcribed in the ſacred writings. See Yaws and Leprosy. See alſo Sauvages Noſol. Method. Claſs X. Gen. 22, where it is divided into two ſpecies; 1. *Frambœſia Guineenſis*; 2. F. *Americana*. Edin. Medical Eſſays, vol. v. part 2.

FRAMBOISE, a name uſed by ſome for the *rubus* or black-berry-buſh. See Raspberry.

FRAME, in *Architecture*, two or more pieces of timber joined together by mortiſe and tenon, ſo as to include a ſpace, the leaſt number of ſtraight pieces that can be joined ſo as to conſtitute a frame being three. Frames in carpentry are generally divided into triangles, and thoſe of joinery into rectangles, as in doors, ſhutters, and wainſcotting.

Frame is alſo a machine uſed in divers arts. The printers' frame is a ſtand whereon they place the *caſes*, which ſee.

The founders' frame is a kind of ledge, incloſing a board, which being filled with wetted ſand, ſerves as a mould to caſt their work in. See Foundery.

Frame is more particularly uſed for a ſort of loom, whereon artizans ſtretch their linens, ſilks, ſtuffs, &c. to be embroidered, quilted, or the like.

Frame, among *Painters*, &c. is a kind of ſquare, compoſed of four long pieces or ſlips of wood joined together; the intermediate ſpace whereof is divided by little ſtrings or threads into a great number of little ſquares, like the meſhes of a net; and for that reaſon ſometimes called *reticula*.

Its uſe is in reducing of figures from great to ſmall, or augmenting their ſize from ſmall to great. See Designing.

Frame, *Garden*, a ſort of box furniſhed with glaſs covers or lights at top to ſlide, being uſed in gardens for protecting and forwarding tender and early plants of different kinds.

Frames of this ſort are moſtly formed of inch or inch and quarter deal boards, being made of different dimenſions, the largeſt about three yards and a half long, and one and a half wide, as high again or more in the back as in the front, to give the top a due ſlope to the ſun, and proper declivity to carry off the wet, when covered with the glaſs lights occaſionally, as they are wanted in the culture of the plants.

Theſe common kitchen-garden frames may be of three different ſizes, as for one light, two lights, and three lights; the two laſt of which, however, are the moſt material, and employed for general uſes; but it is neceſſary to have one or more one-light and two-light frames, eſpecially in private gardens, the former as a ſeed-frame for a ſmall hot-bed, particularly the ſeeds of cucumbers and melons for the early crops, and other tender plants, and the latter as a nurſery-frame to the young plants of the ſame kinds, &c. to forward them to a due ſize for the three-light frames.

The one-light frame may be about four feet and a half in width, from back to front, and three feet ſix inches the other way; fifteen or eighteen inches high in the back, and from

from nine to twelve inches high in front, with a glafs fafh or light made to fit the top completely, fo as to flide up and down and remove when neceffary. And the two-light frame may be feven feet long, four and a half wide, and fifteen or eighteen inches high in the back, and from nine to twelve in front, having one crofs bar three inches in width, ranging from the middle of the back at top to that of the front, ferving both to ftrengthen the frame and help to fupport the lights; the two lights to be each three feet fix wide, made to fit the top of the frame exactly. But a three-light forcing frame fhould be ten feet fix inches long, four and a half wide, and from eighteen inches to two feet high in the back, and from nine to twelve and fifteen inches in front; thofe defigned principally for the culture of melons being rather deeper than for cucumbers, as they generally require a greater depth of mould or earth on the beds; though frames eighteen or twenty inches in the back, and from nine to twelve in front, are often made to ferve occafionally both for cucumbers and melons; each frame fhould have two crofs bars ranging from the top of the back to that of the front, at three feet fix inches diftance to ftrengthen them and fupport the lights; the lights fhould be each three feet fix inches wide; the whole together being made to fit the top of the frame exactly every way.

They are fometimes made of larger dimenfions than the above, but they are very inconvenient to move to different parts where they may be wanted, and require more heat to warm the internal air; in refpect to depth, if they are but juft deep enough to contain a due depth of mould, and for the plants to have moderate room to grow, they will be better than if deeper, as the plants will be always near the glaffes, which is an effential confideration in early work, and the internal air be more effectually fupported in a due ftate of warmth; as the deeper the frame the lefs the heat of the internal air in proportion; and the plants being further from the glaffes will be difadvantaged in their early growth, for which reafon London kitchen-gardeners have often many of their forcing frames not more than fourteen or fifteen inches high behind, and eight or nine in front, efpecially thofe which are intended to winter the more tender young plants, fuch as cauliflowers, lettuces, &c. and thofe for raifing early fmall fallad herbs, raddifhes, and many others.

But when for the protection of taller plants, they fhould be deeper in proportion. If defigned as a nurfery-frame for young pine-apple plants, three feet fix by fifteen or eighteen inches are the proper depth, arranging the largeft plants behind, the young yearling ones more forward, and the crowns and fuckers of the year in front of all; a frame of thefe dimenfions may ferve alfo for any of the hardier kinds of low green-houfe plants, as myrtles, &c. where there is not a proper green-houfe, or as an cafement to it, when too much crowded. It is ufeful alfo as an occafional winter fhelter to many forts of curious young plants, evergreens, and others of the full grown, which, being tenderifh in their younger growth, require protection for two, three, or more years, till they increafe in ftrength and are gradually hardened to the full air and atmofphere.

Deep forts of frames are fometimes made ufe of in the culture of particular forts of plants, to bring them up to a proper height. See DRAWING *Frame*.

In all forts of frames the wood-work of the backs, ends, and fronts fhould be of fuch thick deal as has been mentioned, which muft be all neatly planed even and fmooth on both fides, and the joints in framing them together be fo clofe that no wet or air can enter; the crofs bars or bearers at the tops for the fupport of the glaffes fhould not be above three inches broad and one thick, and neatly dove-tailed in at the back and front even with both edges, that the lights may fhut down clofe, each having a groove or channel along the middle to conduct off all wet falling between the lights; at the end of each frame, at top, fhould be a thin flip of board four inches broad, arranged from back to front, joining clofe up to the outfide of the lights, which is neceffary to guard againft cutting winds rufhing in at that part immediately upon the plants, when the lights are occafionally tilted behind for the neceffary admiffion of frefh air, or other purpofes. In regard to the lights, the wood-work of the frame of each fhould be inch and half thick, and two and a half broad; and the bars for the immediate fupport of the glafs-work about an inch broad, and not more than inch and half thick, as when too broad and thick they greatly intercept the rays of the fun. They fhould only be juft fufficient to fupport the glafs-work without bending, and be ranged from the back part to the front with exactnefs.

The glafs-work may either be laid in lead and well trimmed with cement, air and water tight, or in the bars of wood in putty, lapping at the ends; the latter method is by fome preferred, as being more effectual for the difcharge of wet, the lapping of the panes being left open or unputtied at bottom, that the rank vapour naturally arifing in hot-beds, and all condenfed drops againft the glaffes, may be difcharged at thefe places, as well as admit a perpetual moderate current of frefh air, which may be beneficial to the plants; this mode, however, of leaving the lappings open, is by fome objected to, efpecially for very early work, on account of the too free admiffion of air in cold weather.

All the wood-work, both of the frames and lights, fhould be painted in oil, to preferve them from decay; a lead colour will be the moft eligible, and if done three times over, outfide and in, will preferve the wood exceedingly from the injuries of weather, and from the moifture of the earth and dung.

Frames for thefe purpofes are fometimes made in a fort of hollow brick-work, fo as to admit the heat from without. See *Plate on Forcing Frames*.

FRAME-*work*, that fort of forcing and raifing vegetable productions at an early period, which is performed by means of frames and artificial heat applied by them. See FORCING.

FRAMERY, NICHOLAS STEPHEN, in *Biography*. This ingenious gentleman is only mentioned by M. Laborde, in his "Effais fur la Mufique," as a French lyric poet, who has furnifhed "Le Theatre Italien" with many fuccefsful comic operas: adding, "We owe to him "La Colonie," one of the beft works of its kind, which always fills the heatre, though it has been reprefented perhaps two hundred times." This drama was written in French, and admirably adjufted to the mufic of Sacchini's Italian comic opera "L'Ifola d'Amore," which was not only the firft production of that charming compofer that was heard in France, but the firft Italian mufic that was ever fincerely felt in that kingdom. Befides the favourable account of it by M. Laborde, no enthufiaft for Italian compofition; the late perturbed fpirit Linguet, ftill more patriotic in his love of old French mufic, fpeaking of the comic opera of "La Colonie," in his "Journal Politique et Litteraire" for 1777, fays: "Among the works that are moft frequently revived at this theatre, above all others is "La Colonie," which never fails drawing together prodigious crowds. M. Frame-

ry has rendered the public a real service in parodying this Italian opera :" (that is, setting new French words to music that has been originally sung to other words, whether Italian or French.) Linguet continues : " He has at once given us a new piece and a new actress. It was in " La Colonie" that the talents of Mad. Colombe were first developed, whose voice, so extensive, sonorous, and touching, was so calculated to produce great effects in pathetic airs ; effects which were still encreased by the beauty of her figure. The Colony is perhaps the most beautiful Italian music which has been heard in our theatres ; no other, at least, has produced similar enthusiasm : it is by tears and screams of extacy that many of the airs have gained applause ; all the tones, every accent of grief, love and despair, succeed each other so rapidly, as to imitate the emotions of nature, without a single cry of art escaping that is displeasing. There is no less perfection in the cheerful and playful airs of Sacchini than in the more serious. The melody of the whole is exquisite, nor is it ever suffocated by the orchestra. Such master-pieces as this will form the national ear and taste, by the best of all lessons, pleasure."

The task which M. Framery undertook, and so admirably executed, manifested an equal knowledge of poetry and music. To make the accents of the French language correspond with the accents of Italian melody, to the satisfaction of his countrymen, so tender of their own language, and so hostile to Italian music, was an Herculean labour. But M. Framery, not trusting to conjecture or report concerning the composition and performance of Sacchini's music, came over into England in 1774, during the regency of Mrs. Yates and Mrs. Brooke, where he found Sacchini, and not only conversed with that elegant and intelligent master, but, we believe, saw and heard " L'Isola d'Amore" performed ; and after the success of "La Colonie," represented in 1775, he went to work on Sacchini's serious opera of " L'Olimpiade," which he had heard performed in England, and in 1777, having translated it into French, preserving the same measures in the airs, he had it performed at the French theatre Italien, where it was received with enthusiasm, though performed by comic actors, unused to heroic music or poetry. Luckily for the votaries of Italian music in France, M. Framery is one of the editors of the Encyclopedie Methodique, in which capacity he manifests as much knowledge in the theory, as good taste in the practice of the musical art.

FRAMING, in *Gardening*, the art of raising different sorts of tender plants and vegetable productions to perfection at an early period, by the use of frames and hot-beds ; or by heat applied in some other way, by means of them. Framing is carried on very extensively in many situations, and with a great variety of different kinds of plants, roots, and fruits. It requires much nice care and attention in order to succeed in a perfect manner. See FORCING and HOT-*House*.

FRAMING *of a House*, all the timber-work therein, *viz.* the carcase, flooring, partitioning, roofing, cieling, beams, ashlering, &c.

FRAMINGHAM, in *Geography*, a township of America, in Middlesex county, and state of Massachuset's, containing 1625 inhabitants ; incorporated in 1700, and distant 24 miles W.S.W. of Boston.

FRAMLINGHAM, a town of England, in the county of Suffolk, where the princess Mary retired before she came to the crown, after the death of her brother Edward VI. It has a weekly market on Saturday. In 1801 the number of inhabitants was 1854, of whom 704 were employed in trade and manufactures ; 88 miles N.N.E. of London.

FRAMPEN, a town of Pomerelia ; 12 miles S. of Dantzic.

FRAMPOLE FENCE, a privilege enjoyed by the tenants of the manor of Writtel, in Essex ; whereby they are entitled to the wood growing on the fence ; and as many trees and poles as they can reach from the top of the ditch with the helve of an ax, toward the repair of their fence.

The chief justice, Brampton, whilst steward of this court, acknowledged he could not find out the reason why these fences were called frampole. It may come from the Saxon, *fremful*, *profitable* ; or may be a corruption of *franc-pole*, because the poles are free for the tenant to take.

FRANC. See FRANK.

FRANC, GUILLAUME, in *Biography*, supposed by Bayle (art. Marot,) to have been the first who set melodies, in a single part only, to the French metrical psalms of Clement Marot. To this fact Beza himself bears testimony in a kind of certificate, signed with his own hand, and dated Nov. 2, 1552. One of Bayle's correspondents informs him that he had in his possession a copy of the Geneva psalms, printed in 1564, with the name of Guillaume Franc in the title-page ; and to this edition is prefixed the licence of the magistrates, signed Gallatin, and sealed with red wax, declaring Guillaume Franc to be the author of the musical notes to which the psalms in that impression were set. Some deduction however must be made from this account, as several of the old melodies sung to the French psalms of Clement Marot, as well as to those of Sternhold and Hopkins, are known to be German, and to have been previously used by the Bohemian Brethren, John Huss, Jerome of Prague, Martin Luther, and perhaps by our pristine reformer, John Wickliffe. We have long thought that the most elegant psalmodists at the time of the reformation, such as Louis Bourgeois, Claude Gondinel, and Claude le Jeune, were not the inventors of the original melodies to the psalm-tunes ; and it appears from this account of Franc that they only harmonized them in plain counterpoint. See PSALMODY.

FRANCA, in *Botany*, Mich. Gen. t. 22 ; see FRANKENIA.

FRANCAIS, or FRANÇOIS, *Port des*, in *Geography*, so called by M. La Pérouse, a bay, or rather harbour, on the N.W. coast of America, situated in 58° 37′ N. lat. and 139° 50′ W. long. from Paris. The variation of the compass is 28° towards the E., and the dip of the needle 74°. On the days of the new and full moon, the tide rises 7½ feet, and it is high water at one o'clock. M. La Pérouse suggests that, notwithstanding some inconveniences attending this harbour to those merchantmen who trade for furs on speculation, it has many advantages which recommend it for the establishment of a factory similar to that of the English at Hudson's bay. Its entrance, rendered difficult by the currents, is so narrow, that it might be defended by a single battery of four cannon, placed on the point of the continent. The fort, the magazines, and the whole commercial establishment might be erected on " l'isle de Cenotaphe," which is about a league in circumference, very capable of cultivation, and supplied with wood and water. Cargoes might be collected at one point, and thus prevent the delay of ships ; and buoys laid down for the interior navigation of the bay would render it very safe and easy, and pilots might be formed so well acquainted with the currents, as to ensure the safety of ships coming in and going out, and the otter skins are so plentiful, that

that a greater quantity, as Péroufe conceives, could not be collected in any other part of America. The climate of this coaft is much milder than that of Hudfon's bay in the fame latitude. The pines that grow here were found to meafure 6 feet in diameter and 140 in height. Vegetation is extremely vigorous during three or four months of the year, and the foil feems to be well adapted for all common plants. The woods abound with ftrawberries, rafpberries, and goofeberries. The rivers are full of trout and falmon, and the bay furnifhes various forts of flat-fifh, and alfo of fhell-fifh. In the woods were found bears, martens, and fquirrels, and the Indians fold bear-fkins, both black and brown, and thofe of the ermine, marten, Canadian lynx, fquirrel, beaver, mountain rat of Canada, red fox, &c.: but the valuable, and in this place the moft common fkins, are thofe of the fea-otter, fea-wolf, and fea-bear. Although the different fpecies of birds are not numerous, yet individuals of each are plentiful; even the copfes were full of linnets, nightingales, blackbirds, and water-quails, whofe fongs were very agreeable. The primary mountains of granite, or of fchift, covered with eternal fnows, where no trees nor plants are feen, have their bafes in the water, and form a kind of quay along the fhore. Their fides are fo fteep that wild goats cannot climb beyond the firft two or three hundred toifes; and all the ftreams by which they are divided are converted into immenfe glaciers, whofe fummits rife beyond the reach of fight, while their bafes are wafhed by the fea; and at the diftance of a cable's length from fhore the water cannot be founded with a line of 60 fathoms. The fides of the harbour are formed of mountains of the fecond order, eight or nine hundred toifes high, decorated with pines and verdure, and only covered with fnow on their fummits. They feemed entirely compofed of fchift in the commencement of its decompofition, and though difficult of afcent, are not quite inacceffible. The conftitution and manners of the inhabitants are adapted to the rough and uncultivated ftate of the foil; and waging continual war with every kind of animal, they defpife the vegetable productions that fpring up around them. Although the arts of life are here confiderably advanced, and they have made confiderable progrefs towards civilization, yet that kind of civilization which polifhes manners and foftens ferocity is yet in its infancy; for their mode of life, excluding all fubordination, expofes them to be continually agitated by fear or vengeance, and being choleric and prone to violence, they inceffantly raife their poignards againft one another. Subject to famine in the winter, they enjoy in fummer the moft profufe abundance; for in lefs than an hour they catch fifh enough for the fubfiftence of their families during the day. The reft of their time is confumed in idlenefs, or devoted to play, which they purfue with as much ardour of paffion as the diffipated inhabitants of a great metropolis, and, like them, they make it the grand inexhauftible fource of quarrels. The fhips of the French navigators were continually furrounded by canoes of Indians, who, after a lapfe of three or four hours, would commence an exchange of a few fifh, or two or three otter-fkins, feize every opportunity of plunder, fteal every piece of iron that could be carried away, and in the night time, by every means of eluding vigilance, whilft the principal perfons among them were loaded with prefents, they were never afhamed of ftealing a nail or an old rag of cloaths. Thefe people feemed to be always quarrelling among themfelves; were indifferent to their children, and tyrants to their wives, whom they condemned to inceffant and intolerable labour. The navigators never landed without being armed and in a body, for the people greatly dreaded their mufkets; and eight or ten Europeans together might command a whole village. This village confifted of three or four pent-houfes, 25 feet long, and 15 or 20 broad, covered only to windward with planks or bark of trees, in the middle of which were fufpended falmon and other fifh to dry in the fmoke. Eighteen or twenty perfons lodged in each of thefe pent-houfes; the women and children on one fide, and the men on the other. Each cabin appeared to conftitute a tribe independent of its neighbours, which poffeffed each a boat and a fort of chief, and left the bay, carrying with them their fifh and wood, whilft the reft of the village took no part in their proceedings. This port feems to be inhabited only during fummer; for there was not a fingle cabin fheltered from rain, and though there were not at any time more than 300 Indians together in the bay, our navigators were vifited by 7 or 800 others. In their canoes they carried their houfes and furniture, confifting of feveral little chefts, containing their moft valuable effects. Thefe chefts were placed at the entrance of their cabins, which are more filthy and noifome than the dens of the moft loathfome animals. Every thing about them bears the appearance of dirt and filth, indolence and lazinefs. The wooden veffels in which they cook their fifh are never wafhed, but ferve equally for kettle, difh, and plate; and as they cannot be placed on the fire, they boil their water by throwing in red hot flints, continually renewing them till their food is completely dreffed. The dog being the only animal with which they feem to have made any alliance, there are commonly two or three of thefe in each cabin. The men pierce the cartilage of their nofe and ears, and attach to them various ornaments. They fcarify their breafts and arms with a fharp iron inftrument, whetting it upon their teeth as on a hone. Their teeth are filed down even with the gum; their faces and other parts of their bodies are painted in a frightful manner, with ochre, lamp-black, and black-lead, mixed up with the oil of the fea-wolf. During their chief ceremonies, their hair is long, powdered, and dreffed with the down of various fea-birds, which they count their greateft luxury. A plain fkin covers their fhoulders, whilft the reft of the body is left naked. They have great varieties of head-dreffes, which were formed to render them more frightful, and probably to infpire their enemies with terror. Some of the Indians had entire fhirts of otter-fkins, and the ordinary drefs of the grand chief was a fhirt made of the elk-fkin. The arms of the women only are tattooed; and each of them has the lower lip cut acrofs even with the gums through the whole width of the mouth; and in this incifion they wear a kind of ladle without handles, which preffes againft their gums, to which their cut lip ferves as a pad outwards, fo that the lower part of the mouth projects two or three inches. Thefe women, however, the moft difgufting on earth, covered with fœtid, and frequently untanned fkins, excited defires and careffes, which, after fome reluctance, they freely indulged. Thefe people feemed to have neither temple nor priefts, nor any kind of religion. In fize and figure they differ very little from Europeans; their features are round, but their eyes never communicate one tender fentiment. The colour of their fkin is brown, being tanned by conftant expofure to the fun, as their children are born white. They have lefs beard than Europeans, but enough to refute the error that the Americans are deftitute of beards. Their bodily frame is feeble; fome of them indicated fymptoms of fcurvy; and they arrive at no great age. M. La Péroufe is of opinion that thefe people are not *Efquimaux* (which fee); but that they have a common origin with all the inhabitants of the interior of Canada, and the northern parts of America. Thefe Indians have made much greater pro-

grefs

grefs in the arts than in morals, and their induftry is more advanced than that of the inhabitants of the South fea iflands, agriculture excepted. They are acquainted with the method of forging iron and moulding copper. They fpin the hair of various animals, and, with a needle, form of that wool a manufacture fimilar to our tapeftry. With this web they mingle ftrips of the otter-fkins, which gives to their cloaks a refemblance of the fineft filk-fhag. They are peculiarly fkilful in the manufacture of ftraw hats and bafkets; and they fculpture men and animals in wood and ftone. They decorate boxes of an elegant form with fhell-work, and cut the ferpentine ftone into jewels, to which they give the polifh of marble. Their arms confift of the poignard, a lance of wood hardened in the fire, or of iron, and a bow and arrows ufually pointed with copper. Seven large canoes, found wrecked at the mouth of the harbour, led M. la Péroufe to conclude that Port de Français was an emporium, inhabited only during the fifhing feafon; and he thinks it poffible that the Efquimaux, in the vicinity of the Shumagin iflands, and of the peninfula explored by captain Cook, might extend their commerce to this part of America, furnifhing it with iron, and other articles, and taking, with great advantage to themfelves, the otter-fkins which they fo eagerly defire.

The language of this people, fays M. de Lamanon, who particularly examined it, manifefts no refemblance to that of Alafka, Norton found, Nootka, Greenland, or the Efquimaux, Mexicans, Nadoeffis, and Chipawas, whofe vocabularies he collected. Neverthelefs there ought to be a great affinity of found between this language and that of the entrance of Nootka found, for K is the predominant letter in each, and occurs in almoft every word. Their initial confonants and terminations are very often the fame; and it is not perhaps impoffible that this language may have a common origin with that of Mexico: but if this be the cafe, the origin muft be very ancient, fince their words have no refemblance, except in their elements, but not in their fignification.

No trace of cannibalifm was perceived among thefe people, though it is fo general a cuftom among the Indians of America; but poffibly it might have been otherwife, if they had been at war, or had taken any prifoners, during the ftay of our navigators among them. La Péroufe's Voyage, vol. i.

FRANCAISE, La, a town of France, in the department of the Lot, and chief place of a canton, in the diftrict of Montauban; 7 miles N.W. of Montauban. The place contains 3,203, and the canton 5,808 inhabitants, on a territory of 145 kiliometres, in 5 communes. N. lat. 44° 7'. E. long. 1° 20'.

FRANCAVILLA, a town of Naples, in the province of Otranto. It is large and well built, the ftreets are wide and ftraight, and the houfes fhewy, though in a heavy ftyle of architecture. In 1734, a confiderable part of the town was deftroyed by an earthquake; and fince that time the inhabitants have erected their houfes to the height of no more than one ftory above the ground-floor. The avenues to the gates are well planted with trees, which afford an agreeable fhade. The inhabitants, about 12,000 in number, fubfift by the fale of oil and cotton, of which laft they make very fine ftockings. The tobacco, which is raifed in confiderable quantity in the vicinity, is manufactured into a kind of fnuff, refembling the Spanifh in colour and flavour. This town derived its name Francavilla, or Fair town, from a colony planted here in 1310, by Philip of Anjou, prince of Taranto, who granted lands to all comers, with ten years' exemption from taxes, and gave it an olive-tree, the emblem of peace and fertility, for its armorial feal. The manfion of the prince is a quadrangular caftle, furrounded by a dry ditch. About the middle of the fixth century, this and the adjoining manors were purchafed by the Imperials of Genoa, from St. Charles Borromeo, archbifhop of Milan, who is faid to have diftributed in one day the whole purchafe-money to the poor of his diocefe, afflicted at that time with peftilence and famine; 15 miles E.N.E. of Taranto.—Alfo, a town of Naples, in the Bafilicata; 11 miles S.W. of Turfi.—Alfo, a town of Naples, in Calabria Ultra; 13 miles W.S.W. of Squillace.—Alfo, a town of Naples, in Calabria Citra; 4 miles N.E. of Caffano.—Alfo, a town of Naples, in Abruzzo Citra; 9 miles N.E. of Civita di Chieti.—Alfo, a town of Sicily, in the valley of Demona; 12 miles W.N.W. of Taormina.—Alfo, a town of Genoa; 6 miles S. of Novi.

FRANCE, in *Geography* and *Hiftory*, is fituated between the fifth degree of longitude weft, and the eighth degree of longitude eaft, from Greenwich; or, according to the French calculation, between the thirteenth and twenty-fifth degrees of longitude by the meridian of the ifland of Ferro, and between the forty-fecond and fifty-fecond degrees of northern latitude.

From north to fouth, or from the Maes and the Wale to the frontiers of Catalonia in Spain, its extent is 300 leagues in length; and from eaft to weft, or from Strafburgh to Breft, 250 leagues in breadth. According to Mr. Necker, the whole extent of France, without the ifland of Corfica, was, in the year 1789, computed at 26,950 fquare leagues, 25 to a degree. The committee of the firft national affembly ftated it foon after at 26,463 fquare leagues. The prefent extent of France, including the ifland of Corfica, but without Genoa, Tufcany, and the Papal dominions, lately added to the French empire, is computed at 762,625 fquare kiliometres, or 30,505 fquare leagues.

The boundaries of France are, on the north fide, the Englifh Channel and the kingdom of Holland; on the north-eaft fide, the Rhine, by which it is feparated from Germany, or the ftates forming the new Confederation of the Rhine; on the eaft fide, that chain of mountains called the Jura, which feparates France from Switzerland; on the fouth-eaft fide, the Alps, by which it is feparated from the kingdom of Italy; on the fouth fide, the Mediterranean fea, and that chain of mountains called the Pyrenees, by which it is feparated from Spain; and on the weft fide, the Atlantic ocean.

France, which by the Romans was denominated Tranfalpine Gaul, or Gaul beyond the Alps, to diftinguifh it from Cifalpine Gaul, on the Italian fide of the Alps, was probably peopled originally from Italy, to which it lies contiguous. Like other European nations, it foon became a defirable object to the ambitious Romans, and was, about half a century before the Chriftian era, annexed to their vaft empire. In their poffeffion it continued till the downfall of the empire, when it was fubdued by the Franks, from whom it received the name of France. Thefe Franks were originally tribes of Germans, who inhabited the diftricts on the Lower Rhine and Wefer. They affumed the honourable name of Franks, or freemen, from a temporary union among themfelves to refift the power of Rome. See Franks.

The hiftory of few countries is better afcertained, or more to be relied on, than that of France, from the commencement of the reign of Clovis, A.D. 481. At this period, or very fhortly after, Clovis (to whofe article the reader is referred for information peculiar to himfelf) poffeffed all the country lying between the Rhine and the Loire, which, though a very extenfive dominion, was neverthelefs confiderably

fiderably lefs than what it now is, as we have above defcribed its boundaries. One of his firft acts, after his marriage with Clotilda, daughter of the duke of Burgundy, was to feize upon that prince's dominions; the duke himfelf being glad to retire into private life. By his wife he was converted to Chriftianity, but his zeal for religion had no effect in reftraining the bounds of his ambition. He employed the remainder of his life in the aggrandizement of himfelf, and in extending his dominions, without any regard to the means by which he could accomplifh his projects. In his attacks on Armorica [Bretagne], he did not prove fuccefsful; and, as we have feen, this part of the country was not united to the crown of France till the clofe of the fifteenth century. (See Armorica.) The fuccefsful oppofition introduced an equal and honourable union: the Franks efteemed the valour of the Armoricans, and the Armoricans were reconciled to the religion of the Franks. The king now turned his attention to the reduction of the northern provinces, which, inftead of being decided by the chance of a fingle battle, appears to have been flowly effected by the gradual operation of war and treaties; and Clovis acquired each object of his ambition by fuch efforts as were fully adequate to its real value. "His favage character," fays Mr. Gibbon, "and the virtues of Henry IV. fuggeft the moft oppofite ideas of human nature; yet fome refemblance may be found in the fituation of the two princes who conquered France, by their valour, their policy, and the merits of a feafonable converfion." The Burgundians, at this time, poffeffed all the country from the foreft of Vofges to the fea of Marfeilles on the one fide, and to the Alps on the other. This vaft tract of country Clovis attempted to fubdue; but, after all his efforts, he was obliged to give up the enterprife, and reft for the prefent contented with forming an alliance with, and accepting military fervice of, the king of Burgundy. The next expedition of Clovis was againft the Vifigoths, whofe territories extended to confiderable diftances on each fide of the Pyrenean mountains, under the pretence of contending with the errors of Arianifm. Alaric, the king of the Vifigoths, a young man deftitute of military experience, though very brave, determined to contend for his country and the altars of his people. His army was defeated, himfelf flain, and Clovis was enabled, as the refult of this victory, to eftablifh himfelf in winter-quarters at Bourdeaux. Touloufe furrendered the next fpring, and the royal treafures of the Vifigoths were tranfported to Paris. Other confiderable places fell into the hands of Clovis, who was foon after ftopped in his career of victory by Theodoric, king of the Oftrogoths, who had overturned the dominion of Odoacer in Italy. About the year 509, Clovis affumed the title of Roman conful, by which the people of Rome were infenfibly led to pay peculiar regard to the French monarchs; and the king was now fuppofed to be invefted with a juft title to all his conquefts, in whatever manner they had been acquired. He was folemnly invefted with his new dignity in the church of St. Martin, in the city of Tours; after which, he entered the cathedral cloathed in all the badges of office. Clovis, as we have feen in his article, died in 511; and his vaft dominions were divided among his four fons, who were perpetually at war with each other. A feries of weak and wicked princes fucceeded, under whom France was reduced to more than its ancient barbarifm. The whole power of the kingdom was invefted in the captains of the king's guard, who were commonly called "Maires du Palais," and who, for many generations, held the French fovereigns in abfolute fubjection, leaving them but little more than the title of king. Of thefe mayors, Pepin and Charles Martel are the moft celebrated. The latter bequeathed the government of France to his two fons, Pepin the younger and Carloman; and, on the refignation of the latter, Pepin fucceeded to the fole adminiftration: and in this exalted ftation he acquitted himfelf fo well, as to render his name illuftrious to fubfequent generations. When he had fubdued his foes, both foreign and domeftic, he determined to affume the title of king, after having fo long enjoyed the regal power; and his defire, in this refpect, feemed to correfpond with the unanimous wifhes of the nation. The nobility were, however, bound by an oath of allegiance to Childeric, the nominal monarch at that time; and this oath they could not difpenfe with but by the authority of the pope. Ambaffadors were accordingly difpatched from the nobility and Pepin to pope Zachary, the reigning pontiff. His holinefs replied, that it was lawful to transfer the regal dignity from hands incapable of maintaining it, to thofe who had fuccefsfully preferved it, and that the nation might unite in the fame perfon the authority and title of king. On this Pepin was crowned in 751, and was the firft monarch of the fecond race of French fovereigns; having driven from the throne of his anceftors Childeric III. whom he confined for the remainder of life in different monafteries, and fet afide the line of Clovis.

The attention of Pepin was firft claimed by the revolt of the Saxons; but they were foon reduced to fubjection, and obliged to pay an additional tribute. The fubmiffion of the Saxons was followed by the reduction of Britanny, and this again by the recovery of Narbonne from the infidels. His next exploit was the protection of pope Stephen III. againft Aftolphus the king of the Lombards. The pope, unable to contend with fuch a powerful rival, croffed the Alps to implore the aid and protection of Pepin, who received him with all the refpect due to his character. He was lodged in the abbey of St. Dennis, and attended by the king in perfon, during a dangerous illnefs. On his recovery, Stephen folemnly placed the diadem on the head of his benefactor, beftowed the regal unction on his two fons Charles and Carloman, and conferred on the three princes the title of "Patrician of Rome." Pepin was not deficient in duty and refpect; in return for thefe high honours he accompanied the pontiff into Italy at the head of a powerful army, and reduced Aftolphus to obedience. Scarcely, however, had Pepin left the country, when Aftolphus broke the treaty which he had been forced to fign with every mark of folemnity. The pope was again reduced to diftrefs, and again applied to Pepin for fuccour, which he received moft readily. After this Aquitaine was once more annexed to the crown of France; but Pepin had fcarcely time to indulge himfelf with a view of his new conqueft when he was feized with a flow fever, which put an end to his life in the year 768.

Pepin was fucceeded in his authority by his two fons, Charles and Carloman; the latter very foon died, and left Charles fole mafter of France, whofe conduct and actions were fo brilliant that he juftly obtained the title of the Great, or Charlemagne, which fee. This prince took poffeffion of Lombardy in Italy, carried on a war with the Saxons, and brought the whole of Germany under his dominion. He likewife took a great part of Spain from the Saracens, and was fo much feared in the Eaft, that the king of Perfia fent him prefents, gave him a title to Jerufalem, and the Holy Land, calling him his lieutenant, and he was at length proclaimed emperor, in the year 800. It may be worthy of obfervation that Pepin had introduced the fyftem of annual parliaments, in which the clergy and nobles were called on to deliberate on public affairs, and the wants of the

the people. Charlemagne carried this meaſure one ſtep farther; he appointed theſe aſſemblies to be held twice a year, to which he invited the people as a party, by admitting from each province twelve deputies. The aſſembly now conſiſted of three eſtates, each forming a ſeparate chamber, that diſcuſſed apart the concerns of its own order, and afterwards united to communicate their reſolutions, or to deliberate on their common intereſts. The empire of Charlemagne, raiſed and ſupported ſolely by his authority and great talents, fell to pieces under his poſterity. His ſurviving legitimate ſon Lewis (Le Debonnaire) was conſecrated emperor and king: and as almoſt the firſt act of his reign, he divided the kingdom among his ſons, who were perpetually engaged in violent quarrels with one another, and who ſeemed to agree in no one thing but in a joint hoſtility to their father, in which they were ſupported by pope Gregory IV. At length Lewis was compelled to ſurrender himſelf priſoner to his own children, and finiſhed an inglorious reign in the year 840. The diſſentions of the brothers ſtill continued. Lotharius, now emperor, and Pepin, his brother's ſon, took up arms againſt the two other ſons of Lewis le Debonnaire, Lewis of Bavaria and Charles the Bald, and were defeated by them in a pitched battle, in which it is ſaid 100,000 were left in the field. Lotharius was at firſt depoſed by an aſſembly of biſhops, but ſoon ſo far aſſuaged the reſentment of his enemies as to become a party in a new partition of the empire. By this the weſtern part of France was aſſigned to Charles the Bald. Lotharius, with the title of emperor, had the nominal ſovereignty of Italy, and the real territory of Lorraine, Franche Compte, Provence, and the Lyonnois: the kingdom of Germany fell to the ſhare of Lewis, who was hence denominated Lewis the German. By this partition, Germany and France were ſo disjoined, as never afterwards to be united under one head. From the year 845 the provinces were much haraſſed by the inroads of the Normans, till at length leave was granted to them to ſettle in Frieſland. During the reign of Charles the Gros theſe piratical invaders failed up the Seine with a fleet of 700 ſhips and laid ſiege to Paris. They were induced to abandon their undertaking by the bribe of a very large ſum of money, and not by the power of the exiſting government. The money not being readily raiſed, they were allowed to remain in the neighbourhood of Paris during the winter; and they requited this indulgence by plundering the country, and amaſſing immenſe wealth, independently of the ſum which had been promiſed by the king. After this ignominious tranſaction Charles returned to Germany, where he was ſo far abandoned by his friends, as not only to be depoſed, but reduced likewiſe to a ſtate of abſolute penury, and muſt literally have ſtarved but for the charitable aid of the archbiſhop of Mentz. On the depoſition of this abject prince, Eudes, count of Paris, was choſen king during the minority of Charles, afterwards ſtyled "Charles the Simple." He defeated the Normans and repreſſed the power of the nobility, which occaſioned ſo much oppoſition that he was obliged to reſign the crown, and the greater part of the kingdom to the young prince, and conſented to do him homage for that part which he ſtill held as ſovereign. Shortly after this Eudes died, and Charles ſucceeded to the whole power. During his reign the French government declined. By the introduction of fiefs thoſe noblemen who had got poſſeſſion of governments, having theſe confirmed to them and their heirs for ever, became, in a manner, independent ſovereigns: and as theſe great lords had others under them, and they again had others under them, and even theſe had their vaſſals; inſtead of the ſimple and equal government that prevailed before, a vaſt number of inſupportable little tyrannies was erected. The Normans, too, ravaged the country in the moſt terrible manner, and deſolated ſome of the fineſt provinces of France.

At length, in the year 912, Rollo, a chief of the Normans, compelled Charles the Simple to yield him a large portion of his territory, and to give him his daughter in marriage. The new kingdom was called Normandy, of which Rouen was the capital. Rollo, on this occaſion, became a Chriſtian, and changed his own name to Robert, in the ceremony of inveſtiture. Rollo rejected with diſdain the ſervile indignity of proſtrating himſelf before and kiſſing the feet of the ſovereign, and one of his guards was accepted as his ſubſtitute; the rude Norman, unpractiſed in the arts of courts, handled the royal foot ſo rudely, as nearly to overturn the chair, and endanger the ſafety of Charles. In this reign the imperial dignity was transferred from France to Germany. During the remainder of the reign of Charles the Simple, and the next three or four reigns, the power of the Carlovingian race continually declined: no great man roſe up among them to redeem the character of the monarchy, and to inſpire the people with new vigour, and at laſt they were completely ſupplanted by Hugh Capet, who was already, by creation, a prince of France. This revolution happened in the year 987, and was brought about in the ſame manner as the former one had been by Pepin. He was acknowledged at Rheims, A. D. 988. The character of Hugh Capet was not marked with any of thoſe commanding features which generally diſtinguiſh the founder of a new dynaſty; but his policy, his talents and moderation, were well adapted to the times in which he lived. Under him Paris became the ſeat of government, and to prevent the incurſions of the Normans, he fortified ſeveral advantageous ſtations, and eſtabliſhed a magazine of arms at Abbeville. The greater part of his reign was paſſed in ſtrict tranquillity, and he died in October 997, having been on the throne ten years, leaving his crown to his ſon Robert.

The new king inherited the good qualities of his father, and in his reign the kingdom was enlarged by the death of Henry, duke of Burgundy, to whom he was the natural heir. This acceſſion of territory was not obtained without a war of ſeveral years continuance, on account of ſome perſons who laid pretence to a ſuperior right. As Robert thought peace and tranquillity were preferable to widely extended dominions, with a precarious tenure, he refuſed the kingdom of Italy, and the imperial crown of Germany, both which were offered him. His own prudence, juſtice, and moderation, contributed greatly to ſecure the public happineſs, which had ſo honourably diſtinguiſhed his adminiſtration; and at his death, which happened in July, 1030, his ſubjects exclaimed, as with one voice, "we have loſt a father who governed us in peace; beneath whoſe authority we dwelt in ſecurity; who ſuffered not in others that oppreſſion which he himſelf diſdained; who commanded our affections, and who baniſhed our fears." Paſſing over ſeveral reigns, in which there is nothing very remarkable to diſtinguiſh them, we come to Philip I., who is celebrated for having undertaken an expedition to the Holy Land. This expedition, known by the name of the Cruſades, Philip and his adherents were urged to make by Peter the Hermit. Both clergy and laity impreſſed on their garments the ſign of the croſs, and ſolicited the pope to march at their head. This dangerous honour the prudent ſucceſſor of St. Peter declined, recommending, however, to the faithful, who were diſqualified by ſex or profeſſion, by age or infirmity, to aid with their prayers and alms the perſonal ſervices of their more robuſt brethren. After confeſſion and abſolution the champions of the croſs were diſmiſſed, and their departure

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for the Holy Land was fixed for the festival of the assumption, the 15th of August 1096. That day was anticipated by a thoughtless crowd, who to the number of sixty thousand persons of both sexes pressed with clamorous importunity Peter the Hermit to lead them to the holy sepulchre. The hermit, assuming the character without the talents or authority of a general, impelled or obeyed the forward impulse of his votaries along the banks of the Danube and the Rhine. The footsteps of Peter were followed by the monk Godescal, whose sermons had swept away 20,000 peasants from the villages of Germany. The rear was closed with two hundred thousand of the refuse of the people, who mingled with their devotion a brutal license of rapine, prostitution, and drunkenness. Of this vast crowd, the greater part sunk beneath the fatigues of their march and the accumulated pressure of hunger and thirst: the remainder, who had endured and surmounted the difficulties and distress of their long and tedious pilgrimage, had scarcely refreshed their wasted bodies with the hospitable plenty of Constantinople, before their impatience urged them headlong, as it were, against the Turks. This imprudence betrayed them into the snares of the sultan of Nice; and Peter the Hermit, securely sheltered in the Byzantine court, might lament the fate of his improvident companions, and expect the arrival of their more grave and noble brethren. Among these, the first rank both in war and council was justly due to Godfrey of Bouillon, who in the hour of victory was elevated to the transient throne of Jerusalem. With him were joined in the holy enterprize Hugh, count of Vermandois, the brother of the king of France, and Robert duke of Normandy, who for the trifling sum of ten thousand marks mortgaged Normandy, during his absence, to Rufus, who had already defrauded him of the crown of England. (See CROISADE.) It was at the distance of nearly a century from this time that Philip II. in conjunction with king Richard of England, unfurled the sacred banner of the cross, and embarked, the former at Genoa, and the latter at Marseilles; but animosities arising between them, Philip returned and possessed himself of several provinces in France that belonged to the English. Philip died in 1223, and was succeeded by his son Lewis VIII. who reigned three years, when by death he made way for Lewis IX. afterwards styled Saint Lewis. In these and some other following reigns the war was carried on with vigour against the infidels, but in this sketch it is impossible to do more than notice the various revolutions that have occured in the country, and the circumstances which are supposed to have given rise, or at least very much contributed to them. One of the most remarkable transactions that took place at the close of the fourteenth century, was the expulsion and confiscation of the estates of the Knights Templars, who at that period enjoyed immense possessions in France. These confiscations were levied, according to the spirit and practice of the times, without any form of trial, and upwards of fifty of them were put to death in the most cruel manner. The grand master, with three of the principal officers, were burnt by slow fire in the presence of the king himself. The whole body of the knights had been accused of the most immoral practices, of which, indeed, confessions had been extorted, but it was asserted that the horror of impending and cruel deaths had forced from their lips confessions which they afterwards retracted; and it has been generally thought that king Philip, in these severe and brutal measures, consulted his avarice rather than his justice. He died in 1395, and his successor, Lewis the Boisterous, followed him in a few months to his grave, leaving the throne to Philip the Long, who subdued the Flemings, and summoned Edward II. of England to do him homage for his possessions in France; but that monarch, finding himself involved in difficulties which rendered a journey to France highly inconvenient, sent excuses to Philip which he readily accepted. As the French sovereign had formerly taken the cross during the life-time of his father, he now proposed to put his vow into execution, but was dissuaded from it by the pope himself, at whose instance he sent an army into Italy to put an end to the contending factions of the Guelphs and Gibbelines, who for so long a time filled the country with blood and slaughter. The event proved highly unfortunate, and the disgrace was rendered more mortifying by a contagious distemper which swept off many thousands of the French soldiery. This fatality in the army was imputed to the Jews, who were supposed to have poisoned the springs: a persecution was instantly commenced against these unfortunate men, and numbers, without any other pretence than the madness of popular suspicions, were burnt alive; while the Jews in general were abandoned to the rage of the populace, who insulted their persons and plundered their houses without remorse. The remaining part of this reign was spent in attempting to regulate the internal concerns of the country. A design had been formed by his predecessors of establishing a certain standard for the coin, weights, and measures, throughout France; this was adopted by Philip, who, in order to carry it more effectually into execution, purchased from the counts of Valois, Clermont, and Bourbon, their right of coinage within their own dominions: but notwithstanding all his endeavours, he never could bring the scheme to bear. He was embarrassed by new and unexpected difficulties: a report was industriously circulated, that to surmount these he intended to levy a fifth on every man's estate, and the public discontent was increased by the disaffection of the clergy, whom the king by a law had excluded from sitting in parliament. The mind of Philip was too sensibly wounded by the injurious suspicions of his subjects; he beheld his honest endeavours productive of jealousy and disappointment, which he was unable to bear, and he died in the year 1322. His successor, Charles IV., was the last of the royal race of Capet: the character of this prince was not distinguished by any very eminent virtues, nor stained by gross vices; his regard to justice was steady and impartial, of which there are instances on record. He died in 1328, leaving his queen pregnant; and as the succession depended on the event, a regent in the mean time was necessary. Two candidates instantly appeared for this important post, urging at the same time their right to the crown as well as the regency. These were Philip de Valois, cousin to the late king, and Edward III. king of England, who aspired to the throne in right of his mother. His pretensions were easily set aside, and Philip was confirmed in the regency, from which he soon stepped into the throne on the queen being delivered of a daughter; from which circumstance he acquired the surname of "Fortunate." Thus the crown of France had descended in the Capetian family from father to son for eleven generations, and the successive reigns had all contributed to extend the dominion and authority of the monarchs: they had shaken off their dependance on the clergy; they had reduced the power of the barons, and had established the royal revenue on a more permanent foundation. After almost three centuries and a half, the immediate posterity of Hugh Capet, as we have seen, expired in Charles IV. and the sceptre was placed in the hands of the race of Valois.

Philip was almost immediately involved in a war, yet he boldly summoned his rival, Edward of England, to yield him homage for the lands which he held in France. The English monarch passed the seas, and appeared bare-headed without

arms

arms or ſpurs, before a prince whoſe equal he conſidered himſelf: but his mind, indignant at the humiliating act, revolted, and war was immediately kindled between the two nations; and he who had been ſeen in France as a vaſſal, marched into it at the head of a numerous army. His moſt conſiderable ally was James d'Arteville, a brewer of Ghent, under whoſe auſpices the Flemings had acquired a degree of independence unknown in an age when the common people were almoſt univerſally enſlaved by feudal inſtitutions. With d'Arteville, therefore, as a leader, they were very ready and anxious to oppoſe the power of Philip. They adviſed the king of England to aſſume the title of king of France. A long and bloody conteſt enſued, in which the Engliſh were very generally ſucceſsful. Philip was under the neceſſity of ſecuring himſelf againſt the power of his rival by new alliances, and at length was reduced to that exhauſted ſtate that for ſome time he was incapable of making any oppoſition. To recruit his finances he laid a heavy duty on ſalt, which cauſed ſo much offence as nearly to excite a rebellion; but having aſſuaged the diſcontents, he found his hands ſtrengthened, and was ſoon enabled to bring into the field 100,000 men, whoſe prowess was farther raiſed by the preſence of the dukes of Normandy and Burgundy. The Engliſh were therefore compelled to ſtand upon the defenſive. One fortreſs after another ſurrendered to the French, till nothing appeared but a total extinction of the power of England upon the continent. In this ſituation Edward reſolved to bring relief in perſon to his diſtreſſed ſubjects and allies, and embarked for that purpoſe in 1346 at Southampton, with a large army on board of one thouſand ſail of different bulks and burdens. He carried with him the chief, and indeed the flower of the nobility and great men of the country, and his eldeſt ſon the prince of Wales, a youth of fifteen years of age, ſince celebrated in hiſtory as the "Black Prince." The army which the king now took with him conſiſted of 4000 men at arms, 10,000 archers, 10,000 Welch infantry, and 6000 Iriſh; all of whom he landed ſafely at La Hogue, a port of Normandy, which country he determined to make the ſeat of war. The Engliſh had no ſooner landed than they ſpread terror and devaſtation all round them, and an univerſal conſternation reached the French court. The city of Caen was taken and plundered by the invaders, and all the villages and towns, even to Paris, ſhared the ſame fate; and the French had no other reſource but by breaking down their bridges to attempt a ſtop to the career of the Engliſh. Philip was not, however, idle or negligent in making preparations: he had ſtationed an army on the oppoſite ſide of the river Somme, over which Edward was to paſs; while he himſelf, at the head of 120,000 fighting men, advanced to give the Engliſh battle. Thus expoſed to the danger of being incloſed and ſtarved in an enemy's country, the king publiſhed a reward to any that ſhould bring him intelligence of a paſſage over the river. This was diſcovered by a peaſant of the country, and Edward had juſt time to get his whole army over the ſtream when Philip appeared in his rear. The famous battle of Creſſy was now fought, in which the French were completely defeated with the loſs of thirty thouſand ſoldiers, eleven princes, eighty barons, and twelve hundred knights. Edward immediately beſieged the town of Calais, which ſurrendered, and remained in poſſeſſion of the Engliſh 210 years. From the commencement of this war Philip had invariably ſhewed himſelf deſirous of peace, and the victory obtained over him at Creſſy increaſed his anxiety in this reſpect; and fortunately for him, the expences incurred by his opponent were ſo great that he could no longer ſuſtain the conteſt. A truce of three years was accordingly concluded through the mediation of the court of Rome: at the ſame time Philip met with ſome recompence for the loſſes which he had ſuſtained, by the acquiſition of Dauphiny, which had been bequeathed to him by the duke on condition that the eldeſt ſons of the kings of France ſhould take the name of Dauphin. Soon after this event the king himſelf, who had been ſome time a widower, was married to Blanch, the daughter of Philip count of Evreux, and Jane queen of Navarre. But he died within a year of this union, in the fifty-ſeventh year of his age, and the twenty-third of his reign. On the death of Philip, his eldeſt ſon John took poſſeſſion of the kingdom; but ſcarcely was he ſeated on the throne, when he diſguſted his nobility by an unſeaſonable act of ſeverity. Robert de Brienne, count of Eu and Guiſnes, had been taken priſoner by the king of England at Caen, and under pretence of negociating his ranſom had paſſed ſeveral times between France and England; but being accuſed of a treaſonable correſpondence with Edward, he was, by order of his ſovereign, ſuddenly arreſted, condemned, and beheaded, without the form even of trial. Having been conſtable of France, the ſword, the badge of office, was delivered to Charles de la Carda; but his fate was equally unfortunate with that of his predeceſſor, being ſoon after aſſaſſinated by Charles king of Navarre. On the expiration of the truce Edward renewed hoſtilities, being perfectly intent upon the conqueſt of France; but having, by means of his ſon, made an unſucceſsful attempt, he recalled his army. After the departure of which, John aſſembled the ſtates at Paris, explained to the deputies the diſtreſſed ſituation of his finances, and exhibited ſo fully and ſatisfactorily the neceſſity of aſſiſting him in the defence of the kingdom, that they conſented to maintain an army of 30,000 men during the war. To raiſe the neceſſary ſupplies, the ſalic law, as it was called by way of ridicule, or the duty on ſalt, was revived, and many other impoſts that bore heavy on the people; but at the ſame time they appointed a committee of their own number to take care that the money was ſolely appropriated to the public ſervice. The ſatisfaction which John received from theſe grants was ſoon damped by the news that the prince of Wales had invaded his country, and taken ſome important places. Though alarmed, he did not ſit down in deſpair, but aſſembled an army of 60,000 men to ſtop his progreſs, and with the hope of intercepting him. Edward at firſt thought of retreating, but finding that project impoſſible, he determined calmly to wait the approach of the enemy; and notwithſtanding the diſparity of forces, to commit all to the hazard of a battle. At Maupertuis, near Poictiers, the armies came in ſight of each other. The French monarch might, with a common ſhare of prudence, have ſtarved the enemy into any terms he thought proper to impoſe; but ſuch was the impatient valour of the French nobility, and ſuch their certainty of ſucceſs, that he was forced to act in the aggreſſive. While both armies were drawn up in order of battle, and waiting only for the fatal ſignal to commence the bloody attack, they were ſtopped for a moment by the appearance of the cardinal Perigord, who attempted to be a mediator between them. John, however, who felt certain of victory, refuſed to liſten to any terms, unleſs the baſis was the reſtitution of Calais. The Black Prince, exaſperated at the propoſal, boldly declared he was ready to hazard every thing rather than ſeek ſafety on ſuch degrading terms. The onſet was deferred till the next morning, for which both ſides waited with anxious and awful ſuſpence. At length the trumpet ſounded, and a horrible carnage enſued; and in the end the French monarch

title which he derived from Lewis XI. who had been dead more than 300 years; neverthelefs, he was oppofed by the party of the Guifes, on account of the fupport which he had uniformly given to the reformed religion: this was the only obftacle to the acknowledgment of Henry's claims by the greateft part of his fubjects, and in the end it gave rife to a civil war. Henry encamped before Paris, of which he might have made himfelf mafter by famine, had he refufed to grant a paffage to a multitude of old men, women and children, who were ordered to depart the city to fave provifions. For this act of generofity the king was blamed by his generals, but he nobly replied, "That he would rather endure the reproaches of the whole world than thofe of his own heart." At length, perceiving that the Catholics were feeking foreign aid, and that there would be no termination to thefe evils unlefs he renounced the proteftant religion, he, by the advice and earneft perfuafion of his minifter the great duke of Sully, declared himfelf a catholic, and accordingly abjured his former faith at St. Dennis, and was crowned king at Chartres in 1594. This change put him in poffeffion of the whole kingdom, but the proteftants were at firft indignant at his converfion; neverthelefs they were appeafed by the celebrated edict of Nantes, which re-eftablifhed, in a moft folid and effectual manner, all the favours that had ever been granted to the reformed by other princes, and adding fome which had not been thought of before, particularly the allowing them a free admiffion to all employments of truft, profit and honour, the eftablifhing chambers in which the members of the two religions were deemed equal, and the permitting their children to be educated without conftraint in any of the univerfities. Having concluded a peace with Philip II. of Spain, he beftowed all his attention on the improvement of his kingdom, by reforming its laws, regulating its finances, encouraging agriculture and manufactures, enlarging and embellifhing cities, and finally reconciling, in a great meafure, the partifans of contending religions. In all his beneficial fchemes he found an able and faithful affiftant in his minifter the duke of Sully. Thefe two great men, fays the hiftorian, feemed to have been born for one another; greatnefs and true glory were the confequences of their united endeavours to promote the public good. The fchemes of reformation, projected by this king and his minifter, were intended to be carried far beyond the boundaries of France: they were anxious to new-model the whole of Europe, and reduce all its powers into a kind of Chriftian republic, by rendering them as nearly as poffible of equal ftrength. That this republic might be maintained in perpetual peace, they propofed to bring all their differences to be decided before a fenate of wife, difinterefted, and able judges, and then they fuppofed it would be no difficult matter to overturn the Ottoman empire. With a view probably of executing this project, but under the pretence of reducing the exorbitant power of the houfe of Auftria, Henry made immenfe preparations by fea and by land, when he was affaffinated at the age of 57 by Ravaillac, an infane fanatic. The life and character of this monarch have been tranfmitted to pofterity by the pen of his minifter, to which we fhall again have recourfe in the article HENRY.

On the death of Henry IV. the queen-mother, Mary de Medicis, affumed the regency during the minority of Lewis XIII., which was only remarkable for cabals and intrigues of the courtiers. France, which under Henry had rifen from a ftate of miferable anarchy to the higheft pitch of glory, funk now into a wretched ftate of weaknefs. In 1617 the king affumed the government himfelf, banifhed the queen-mother, caufed her favourite Marfhal d'Ancre to be killed, and chofe for his minifter the celebrated Cardinal Richelieu. This wife minifter reconciled the contending parties, and re-eftablifhed the dignity of the monarchy. The proteftant party attempted to throw off their allegiance, and eftablifh an independent ftate, of which Rochelle was to be the capital. The Dutch vigoroufly affifted Richelieu in fubduing the proteftants, while the Englifh fent out a fleet in aid of the inhabitants of Rochelle, who maintained their ground for a whole year againft the French with the cardinal at their head. At length, however, they were forced to furrender, and this, with all the proteftant cities of France, were ftripped of their privileges, and their religion effectually crufhed. Lewis XIII. entered completely into the views of his minifter, who influenced the politics of all the courts of Europe: the talents of Richelieu were equally and fuccefsfully difplayed in active war, in foreign negociations, and in his domeftic arrangements; yet at this time a confpiracy was forming againft him. Mary de Medicis was jealous of the man fhe had raifed, and was defirous of deftroying the idol fhe had formed. The duke of Orleans fought to fupplant the minifter; but, with aftonifhing intrepidity of mind, he repreffed the confpiracy, feized the Marfhal de Marillac, one of his moft dangerous enemies, at the head of his army, and put him to death. Orleans, apprehending a fimilar fate, fled the kingdom. Mary was arrefted, and ended her days in a voluntary exile at Bruffels. Amidft this turbulence, both of foreign war and domeftic cabal, Richelieu cultivated the purfuits of literature; he was, as we have feen in many of our biographical articles, a liberal patron of the fciences, and of thofe who devoted their lives to the extenfion of knowledge. His adminiftration advanced the glory of France as a monarchy. He died in 1642, victorious, it is faid, over the enemies and the liberties of his country. He expired almoft immediately after his arrival at Paris, where a breach was made in the walls to admit his litter in a fort of triumph. The death of the minifter was fhortly after followed by that of his fovereign in 1643. He was fucceeded by

Lewis XIV. who was only five years of age when he came to the crown of his father. The queen-mother, Anne of Auftria, was appointed regent during the minority, who chofe for her minifter Cardinal Mazarine, whofe violence excited new diforders in the ftate, which caufed his banifhment from Paris; but though retired to the imperial dominions, he influenced and over-ruled the meafures of the court of France. In 1652 Mazarine refumed his ftation as minifter, which he continued till his death in 1661, when the monarch began to act completely for himfelf, and entered on a vigorous difplay of his talents. The finances, which had long been in extreme diforder, were admirably regulated by Colbert; and the commerce and manufactures of the kingdom, wifely encouraged by government, were foon in the moft flourifhing fituation. The famous canal that joins the Bay of Bifcay with the Mediterranean was cut; all the fea-ports were fortified and enlarged, and the internal police ftrictly enforced by the monarch. The arms of France aided at the fame time England againft the Dutch, Germany againft the Turks, and Portugal againft Spain. On the death of Philip IV. Lewis, who had already acquired the addition of *Grand* to his other titles, under pretence that Spain had failed in payment of the dowry of his queen, befieged and took Lifle with feveral fortified cities in Flanders. The king marched himfelf at the head of his armies, but the glory of the conquefts was owing to Turenne and Vaubar. The ftrength and profperity of the kingdom were ftill augmented under the adminiftration of Colbert. The parties in Holland between the Stadtholder and thofe who efpoufed the fide of the virtuous DE WITTS (which fee), tempted Lewis to undertake the conqueft of that country, and England,

land, Germany and Sweden favoured his project. He over-ran feveral of the provinces, and advanced almoft to the gates of Amfterdam, when the Dutch overflowed the country by letting in the fea, and the French were obliged to retreat. At length the confederate powers began to be jealous of the afcendancy of France, and the prince of Orange had fufficient influence with England and the houfe of Auftria to obtain an alliance in aid of the republic. The arms of Lewis, however, ftill continued fuccefsful, and the peace concluded at Nimeguen in 1678 was in favour of France. The armies which France kept on foot, either forefeeing or meditating a new war, enabled the fovereign to humble the pretenfions of Algiers and Genoa. The former was forced to releafe, without any remuneration, all the French fubjects whom they had made flaves, and promifed to exercife that power no more: the latter, more than half demolifhed by bombs, could not fufpend the ardour of the befiegers but by fending its doge and other principal officers to make humble excufes. Having annexed feveral principalities to his vaft dominions, having obtained very important fucceffes in a new war, and having laid the Palatinate wafte, and in ruins, and having likewife revoked the edict of Nantes, the whole continent of Europe, with England at the head, became violent againft the towering ambition of Lewis. Neverthelefs he maintained his ground, though he experienced fome fevere checks; his navy was deftroyed at La Hogue, the coafts were infefted by the Englifh fhips, which deftroyed Havre, and reduced Dieppe to afhes. Victory was, however, the companion of Lewis by land; but the numerous armies which he kept in the field depopulated the kingdom, and occafioned a famine. The people ceafed to admire, and feeling the dire effects of war, they began to murmur. To famine was added the calamity of civil war. The proteftants revolted, becaufe their worfhip was fuppreffed, their churches demolifhed, and their minifters banifhed. France loft half a million of its beft and moft induftrious fubjects, and the name of Lewis the Great was execrated all over Europe. Now the united forces of England and Auftria, under the command of Marlborough and Eugene, (fee Churchill and Eugene,) prevailed, and rendered the conclufion of this reign as miferable, as at the commencement it had been fortunate. From the year 1702, till nearly the clofe of his reign, which happened in 1715, Lewis fuftained a feries of defeats and calamities. As a patron of literature and learned men, he yielded to none of his contemporaries. It was his higheft honour, that he difcerned and recompenfed merit wherever he found it; and France was in his time equally illuftrious by the military talents of her generals, and by the progrefs which fhe made in the arts and fciences. See Lewis.

By the laft will of Lewis XIV. the government of the country devolved on his great grand-fon, who was at the deceafe of the monarch only five years old, and the regency was feized by Philip duke of Orleans, whofe authority was fanctioned by the parliament of Paris. This prince gave a turn to the manners of the court. Inftead of that grave and auftere appearance which had prevailed in it, nothing was now feen but levity and diffipation. Lewis XIV. never formed any connection with the Englifh, but fuch as was indifpenfably neceffary; the regent abandoned himfelf to them entirely, and was guided by their councils, with the hope, no doubt, to fecure their protection and favour, in cafe the young king fhould die, whofe health was exceedingly precarious. The regent himfelf, however, died fuddenly, and was fucceeded by the duke of Bourbon Condé, who endeavoured to enrich himfelf by the ruin of the fyftem at the head of which he was placed. The people murmured at his depredations, but he difregarded their complaints, expecting the fupport of the king. In this he was difappointed; Lewis, when he was capable of acting for himfelf, difmiffed and difgraced him, and he was fucceeded by cardinal Fleury, who was a man of a moft amiable difpofition, and who took the reins of government at an age when moft men retire from the world. (See Fleury.) About this time an artful adventurer, Riperda, raifed himfelf from obfcurity to the government of Spain, by fecretly negociating a treaty between the courts of Madrid and Vienna. To counterbalance this treaty, an alliance was formed between France, England, and the king of Pruffia. Thefe diffentions gave but little interruption to that general tranquillity which Europe enjoyed from the peace of Utrecht till the year 1734. At that period a flame broke out, in confequence of the death of Auguftus II. the king of Poland, and foon fpread itfelf through every part of Europe. Lewis wifhed to place on the throne of that country his father-in-law Staniflaus, but the Ruffians and the houfe of Auftria efpoufed the caufe of the elector of Saxony. A war was commenced, and after it had been carried on with various fuccefs, peace was concluded at Vienna, by which it was agreed that Staniflaus fhould retain the title, but renounce the authority of king of Poland, and fhould be put in poffeffion of Lorraine and Bar. By this treaty the act regulating the fucceffion to the empire, called the "Pragmatic Sanction," was guaranteed by France, as it had formerly been by Holland, England, and other European powers. On the death of Charles VI. his daughter Maria Therefa was not allowed to remain long in quiet poffeffion of that vaft inheritance which her father had been fo anxious to fecure for her. A number of princes laid claim to different parts of her dominions, and the confufion which had been thrown by the feudal fyftem over the right of fucceffion to kingdoms, enabled each claimant to give the appearance of juftice to his pretenfions. Charles Albert, elector of Bavaria, laid claim to the fucceffion of Bohemia, in virtue of the will of Ferdinand I., but while he and other princes were labouring to eftablifh the juftice of their demands, the fuccefsful invafion of Silefia by the king of Pruffia, at the head of 30,000 men, invited other powers to take up arms, and fhewed the feveral competitors that the logic of war could effectually maintain their pretenfions. Notwithftanding the pacific difpofition of cardinal Fleury, France did not long remain an idle fpectator of thefe contefts. This minifter had the mortification, juft before his death, to fee the kingdom involved in calamities, from which it had been the great object of his life and adminiftration to preferve it. To check the ambition of the houfe of Auftria, France united with Pruffia, Saxony, and Poland, in fupport of the pretenfions of the elector of Bavaria, and conceived the defign, not only of putting this weak prince in poffeffion of Bohemia, but of raifing him to the imperial throne. Charles Albert accordingly took the field at the head of the French army, and quickly penetrated into Auftria, but inftead of conducting his troops to Vienna, or of purfuing the queen, who had fled for fhelter to Hungary, he was induced, by his impatience to obtain the titles of fovereign power, to crofs the Danube, and invade Bohemia. This was in the autumn of 1741. Prague immediately fubmitted, and at this city the conqueror was crowned, who then marched to Frankfort, where his vanity was amply gratified by receiving the imperial crown under the name of Charles VII. While this prince was foaring to the fummit of greatnefs in Bohemia and Germany, the king of Pruffia conquered Moravia, but the fituation of Maria Therefa was more deplorable than can well be imagined. She did not however defpair; the fpirit of the brave Hungarians was roufed by her magnanimity; her diftrefs excited the com-

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paffion of the Englifh; diffentions among her enemies, who were too numerous to agree long in any general plan, and who were already intoxicated by the fplendour of their victories, foon gave a turn to her apparently defperate affairs. In 1742 fhe fent into the field a formidable army, recovered Auftria, and even penetrated into Bavaria, and the new emperor, who feemed to have obtained a fecure poffeffion of the imperial crown, faw himfelf, in a moment, ftripped of his hereditary dominions. The marfhal de Belleifle and marfhal Broglio, who commanded the French and Bavarian troops, were prevented, by mutual jealoufy, from forming any concerted enterprize, and being continually haraffed by the army of prince Charles, brother to the grand duke, found themfelves gradually exhaufted, without coming to any decifive action. The defection of the king of Pruffia from the alliance with France, and his treaty with Maria Therefa in the fummer of 1742, completed the ruin of the emperor's fortune, and threw the whole burden of the war on the French. The French generals, unable to keep the field againft a fuperior army, retired under the walls of Prague; and as a refult, the marfhal Belleifle was obliged to make a retreat, in which he obtained fignal honour, it having been compared to the celebrated retreat of Xenophon. The queen of Hungary was crowned at Prague, on the 12th of May 1743; and the emperor was wholly unable to fave Bavaria; but by a revolution as rapid as that which had placed him on the imperial throne, he faw himfelf deprived of all his dominions, reduced to the condition of a fugitive, and a miferable penfioner on the bounty of France.

The two moft powerful ftates, which had hitherto acted as auxiliaries, now became the principal parties in the conteft, and the war, which had originated in a difpute about the fucceffion to the empire, became a violent ftruggle for fuperiority between France and England. They tried their ftrength at the battle of Dettingen in 1743, and the Englifh were decidedly victorious. France began now to tremble for her own fafety, and feeling that energy which, in nations, as well as in individuals, is roufed by the appearance of extraordinary danger, fhe employed all the arts of policy and warfare to avert the ftorm with which fhe was menaced. Among other powers, fhe gained over to her fide the king of Pruffia, who began to dread that the rapid fuccefs of the queen of Hungary might deprive him of all his conquefts. The firft fymptom of the refolute fpirit which actuated the French councils was in a fea fight off Toulon in 1744, in which the Englifh were victorious, though no very decifive advantage was gained over their opponents. But the exertions of France by land were more refpectable. She fitted out four great armies in one year; of thefe the moft confiderable was deftined for Flanders, and with it, Lewis himfelf made the firft campaign, in which he obtained many fignal victories, till he was ftopped in his career by difaftrous news from his own country. Leaving therefore his conquefts in Flanders, he flew to the protection of France, and when he arrived at Metz he had the fatisfaction to hear that Frederic had poured an immenfe army into Bohemia, and another into Moravia; that he had forced Prague to furrender, and made 15,000 men prifoners of war. Here he was taken ferioufly ill, and his indifpofition filled the court and people with confternation and grief; and his recovery caufed the moft rapturous joy throughout his widely extended kingdom. Charles VII. recovered Bavaria, but died foon after; war was however maintained by the oppofing parties. Marfhal Saxe opened the campaign by the fiege of Tournay, the ftrongeft of the barrier towns, which produced, as might have been expected, a general engagement. The event was glorious to France. The king and dauphin had their vanity gratified, by feeing their troops gain a complete victory at Fontenoy over the allied army of Englifh, Dutch, and Hanoverians, confifting of nearly 60,000 men. In confequence of this fuccefs, Tournay, Ghent, Oudenarde, Bruges, Dendermond, Aeth, and even Oftend itfelf, furrendered to the French king. The arms of France and Spain were no lefs fuccefsful in Italy. But in a few months they were obliged to abandon their Italian conquefts. In the Low Countries they were ftill fuccefsful: marfhal Saxe took Bruffels in the middle of winter: Antwerp was taken by the king in perfon; Mons, Namur, and other places furrendered to the arms of France, till at length the entire conqueft of Dutch Flanders was effected. The allies, every where unfuccefsful, folicited peace, which was readily granted by Lewis, who never feems to have felt the ardour and enthufiafm which form the conqueror and hero. A treaty was figned at Aix-la-Chapelle by the plenipotentiaries of England, France, Spain, Sweden, the queen of Hungary, the States-general, the duke of Modena, and the republic of Genoa. The bafis of this treaty, which was figned April 30, 1748, was the reftitution, on both fides, of all the places taken during the war. The articles of this peace were ill calculated to produce a permanent tranquillity. The vague and indefinite manner in which the boundaries of the fettlements of both countries in America were fixed by the treaty of Aix-la-Chapelle, and the continual diffentions and quarrels which this circumftance naturally tended to produce, furnifhed the one nation with abundant occafion for cenfure, and the other for recrimination; and, at laft, produced an open rupture. Other powers foon became parties in this conteft. The world faw with wonder England forming an alliance with Pruffia; and France and Auftria, thofe powers whofe mutual jealoufies had diftracted Europe for two centuries, now connected themfelves by an union as intimate and clofe as their former animofity had been violent and implacable. The early events of this war were glorious for France in every quarter of the globe. Nothing was heard of in England, from all parts, but loffes and misfortunes. Minorca was taken, admiral Byng was defeated at fea, and conftrained to take refuge under the walls of Gibraltar. In India and Canada they were equally unfuccefsful. The military genius of the nation, as well as the fpirit of patriotifm, feemed to be drowned in the clamour of faction. And the people, almoft driven to defpondency, faw a contempt of their arms gradually infinuating itfelf among foreign powers, which was more mortifying to the national pride than all their calamities. About this time the parliaments fell under the difpleafure of the king by their perfecution of thofe who adhered to the bull UNIGENITUS, which fee. They proceeded fo far in this oppofition as to refufe to regifter certain taxes abfolutely neceffary for the carrying on the war. By this the king was fo irritated, that he fuppreffed the fourth and fifth chambers of inquefts, the members of which had diftinguifhed themfelves by their oppofition to his will. This created the moft grievous difcontents, and many of the principal members of the different parliaments refigned their offices. An attempt was made by Damien to affaffinate the king, who was flightly wounded, in the prefence of his fon, and furrounded by his guards. The affaffin was put to the moft exquifite tortures, in the midft of which he perfifted in declaring that he had no intention to kill the king, but that his defign was only to wound him, in order that God might touch his heart, and incline him to reftore peace to his dominions. This attempt upon his majefty is fuppofed to have had fome effect upon him, for he immediately altered his method of government, and accommodated matters with

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his parliament. The peace concluded at Paris in the year 1763, though it freed the nation from a deſtructive, bloody, and, towards the concluſion, unſucceſsful war, did not reſtore its internal tranquillity. The parliament, eager to purſue the victory they had formerly gained over their religious enemies, now directed their efforts againſt the Jeſuits, who had obtained and enforced the bull unigenitus. That once powerful order, however, was now on the brink of deſtruction. A general deteſtation of its members had taken place throughout the world. A conſpiracy, formed by them againſt the king of Portugal, and from which he narrowly eſcaped, had rouſed the indignation of Europe; this was ſtill farther encreaſed by ſome fraudulent practices of which they had been guilty in France. Prejudices running very high againſt them, every miſchief, even to the attempt of Damien, was imputed to their contrivance or influence. Their ruin ſeemed to be certain, when the king interfered, and ſuſpended all proceedings againſt them for a year; a plan of accommodation was drawn up, and ſubmitted to the pope and general of the order, but the latter, feeling the degradation to which his party muſt be expoſed, entirely overthrew, by his own hauteur, the hope of reconciliation. The king now withdrew his protection, the parliament redoubled their efforts againſt them, and the ſociety was finally diſſolved, its members declared incapable of holding any clerical or municipal offices; their colleges were ſeized, their effects confiſcated, and their order annihilated.

The parliament next made an attempt to ſet bounds to the power of the king himſelf. They refuſed to regiſter an edict which Lewis had iſſued for the continuance of ſome taxes which ſhould have ended with the war, and likewiſe to agree to another by which the king was enabled to redeem his debts at an adequate price. The court attempted to get the edicts regiſtered by force, but the parliaments every where ſeemed inclined to reſiſt to the laſt. In 1766, the parliament of Britanny refuſed the crown a gift of 700,000 livres, in conſequence of which they were ſingled out to bear the weight of royal vengeance: the king, however, yielded his rights as he was pleaſed to conſider them, and publiſhed a general amneſty. The parliaments increaſed their claims, and affected to deſpiſe the royal clemency, which exaſperated Lewis ſo much that he ordered the counſellors of the parliament of Britanny, who had refuſed to reſume their functions, of which he had deprived them, to be included in the liſt of thoſe who were to be drafted for the militia; and thoſe upon whom the lot fell were obliged immediately to join their reſpective regiments; the reſt being employed in forming the city-guard. The parliament of Paris remonſtrated ſo freely upon this conduct of the king, that they fell under his cenſure; and the monarch, aſſuming the authority of his anceſtors, explicitly declared that he would ſuffer no earthly power to interfere with his will; and the parliaments were for the preſent intimidated into ſubmiſſion. Lewis next engaged in a conteſt with the pope, and claimed as his own hereditary right the territories of Avignon and Venaiſſin, and while the pontiff denounced his unavailing cenſures againſt him, one of his generals, with a ſingle regiment of ſoldiers, drove out the troops of the pope, and took poſſeſſion of the territories in queſtion. He now engaged in the reduction of the iſland of Corſica, which had been transferred to the crown of France by its ancient maſters the Genoeſe. The iſlanders, little diſpoſed to comply with the wiſhes of thoſe who ſold and who purchaſed their country, reſiſted with the utmoſt bravery the French power; and it was not till the termination of a ſecond campaign, and after the loſs of many thouſands of the beſt troops in France, that the iſland ſubmitted: little was it imagined that at this moment, the future maſter of France, and conqueror of almoſt the whole continent of Europe, was a nurſling of an undiſtinguiſhed and mean Corſican family; he who has torn kings from their thrones, and ſupplanted, or overthrown the ancient dynaſties of the world, was then overlooked and probably deſpiſed for the lowneſs of his condition, and the poverty of his progenitors.

The finances of France were at this time in a moſt deplorable ſtate; many of the great commercial companies of the country were involved in bankruptcy, which brought a ſimilar calamity on moſt of the principal merchants and traders. The miniſter, the duc de Choiſeuil, by one deſperate ſtroke, reduced the intereſt of the funds to one half, and at the ſame time took away the benefit of ſurvivorſhip in the tontines, by which the national credit was greatly affected; the diſputes between the king and his parliaments revived, and became more bitter than ever. Lewis again proved victorious, expelled his parliaments, cauſed others to be appointed who were more ſubſervient to his will, and thus every appearance of oppoſition was ſilenced by the abſolute authority of the king. In the midſt of this plenitude of power, his health declined, and his end was evidently approaching; but the immediate cauſe of his death, which happened in 1774, was the ſmall-pox, which he had taken from one of his miſtreſſes. He was ſucceeded by Lewis XVI. who was then twenty years of age, and to ſecure himſelf againſt the diſeaſe which had proved fatal to his predeceſſor, he ſubmitted to inoculation, as did other branches of the royal family, which rendered this proceſs not only faſhionable among the great, who are ever ready to imitate the court, but tended more than any other circumſtance to remove the prejudices of perſons in the inferior ranks and ſtations of ſociety. The king, as ſoon as he had recovered his health, applied himſelf moſt diligently to the reconciliation of the differences which had ſubſiſted between the court and the people. He removed miniſters whoſe conduct had been marked by arbitrary and illegal acts, and he recalled the old parliaments who had been ignominiouſly diſmiſſed by the late king. He declared, in one of his firſt ſpeeches, that while it was his determination to maintain his royal prerogatives entire, it was his wiſh and moſt anxious deſire to bury in oblivion all paſt grievances. Still it was evident that he meant to reduce the power of the parliaments to a mere cypher; he ſuppoſed that, under his wiſe management, they would be contented with the name without the reality; but his ſubjects were now too enlightened to ſubmit to the decrees of a ſovereign, when they interfered with the rights of the people. He, by his own authority, aboliſhed ſome oppreſſive taxes; and ſhortly after, the parliaments contended that they, by right, had, and ought to have, the ſole power of judging what ought and what ought not be impoſed on the ſubject.

At this time the finances of the country being in a deplorable ſtate, M. Turgot, a gentleman poſſeſſed of ſingular integrity and induſtry, had been appointed to the management of this branch of government; but notwithſtanding his zeal and induſtry, united to other qualities more highly to be appreciated, though more rarely to be found in a miniſter of finance, he had not been able to command the confidence of the country. He was accordingly obliged to reſign his office, and was eventually ſucceeded by M. Neckar, by birth a Swiſs, and a Proteſtant in religion. This able financier had been choſen in the preceding reign to adjuſt ſome differences between the Eaſt India company and the crown, and had diſcharged the truſt in a manner which had gained him the approbation of both parties. Poſſeſſed of very extraordinary talents, his appointment would have excited no ſurpriſe, had it not been contrary to the conſtant policy of

France,

France, which carefully and uniformly excluded the aliens of her country and faith from the controul of her revenue. It now ſtood forward as a new inſtance of enlargement and liberality of ſentiment, worthy the mind of an enlightened monarch.

In the war between Great Britain and the American colonies, Lewis, by the advice of his miniſter, heartily engaged; he afforded effectual aſſiſtance to the oppreſſed acroſs the Atlantic. The principles of their oppoſition to the mother-country were diſcuſſed in all ways and under all ſhapes; every day and hour produced new arguments in favour of their common liberty. The French officers and ſoldiers who had enliſted under their banner heard their reaſonings, felt the generous flame, and at length became patriots inſtead of mere machines wrought into obedience by the force of ſevere diſcipline. It would be needleſs in this article to repeat the events of the American war, which have already been noticed in our work. In the year 1780 ſeveral new changes took place in the French miniſtry, and the ſame year was rendered memorable by the abolition of the inhuman cuſtom of "putting the queſtion," as it was called, by torture, a cuſtom which had been ſo eſtabliſhed by the practice of ages, that it ſeemed to be an inſeparable part of the conſtitution of the courts of juſtice in France. The king likewiſe, at whoſe ſpecial inſtance the torture had been for ever done away, began, with regard to himſelf, and his own expenditure, to inſtitute an economical reform; he readily and cheerfully ſacrificed his own magnificence to the eaſe of his people, and diſmiſſed at once more than four hundred officers belonging to his court. But notwithſtanding theſe attempts at reform, Lewis was obliged to ſubmit to a diſadvantageous peace, on account of the derangement of the public finances. His own example of prudence and economy introduced no public reformation in the manners and habits of thoſe who were rioting on the labours of the poor and induſtrious. Retrenchment in the expenditure became abſolutely neceſſary: an aſſembly of notables was convoked, and diſmiſſed without effecting any material good. Diſappointed of the advantages which the king had flattered himſelf he would have drawn from this body, he was obliged to recur to the uſual mode of raiſing money by the royal edicts. Meaſures were immediately propoſed to double the poll-tax, and to reſort to other impolitic and unpopular impoſts. The parliament of Paris, however, refuſed to regiſter the edicts; and Lewis was obliged to apply, as the laſt reſort, to his abſolute authority, and, by holding what is called "a bed of juſtice," compelled them to enrol the taxes. The parliament, though defeated, were far from being ſubdued; and on the day after the king had held his bed of juſtice, they entered a formal proteſt againſt the edict; declaring, "that it had been regiſtered againſt their approbation and conſent, by the king's authority alone; that it neither ought nor ſhould have any force; and that the firſt perſon who ſhould preſume to attempt to carry it into execution ſhould be adjudged a traitor, and condemned to the galleys." The authority of the ſovereign was now oppoſed to that of the parliament. Paris was already overwhelmed with ſoldiers; and in a few days after the proteſt had been made and promulgated, a French officer of the guards, with a party of ſoldiers, went at break of day to the houſe of each individual member of the parliament, to ſignify to him the king's command, that he ſhould immediately get into his carriage and proceed to Troyes, a city of Champagne, without writing or ſpeaking to any perſon out of his own houſe before his departure. The orders were all ſerved at the ſame inſtant; and before the citizens of Paris could poſſibly be acquainted with the tranſaction, their magiſtrates and protectors were far on the road to their place of baniſhment. The confidence and attachment of the people roſe in proportion to the ſacrifices which had been made in their behalf. Their murmurs were openly expreſſed in the ſtreets of the capital; and the general diſſatisfaction was augmented by the ſtop that was put to public buſineſs, by the exile of the parliament. The cabinet, at the ſame time, was apparently weak, diſunited, and fluctuating; and continual changes took place in every department of the ſtate. Nor was it only in the capital that the flame of liberty burſt forth: it blazed with equal ſtrength in the provincial parliaments, and extended from the centre to every part of the kingdom. Among other inſtances of this nature, the parliament of Grenoble paſſed a decree againſt "Lettres de cachet," the moſt odious engine of arbitrary power; and declared the execution of them within their juriſdiction, by any perſon, and under whatever authority, to be a capital crime.

Previouſly to the baniſhment of the parliament of Paris, they had declared, that, in their opinion, neither the parliaments, nor any other authority, except that of the three eſtates of the kingdom collectively aſſembled, could warrant the laying of any permanent tax on the people; and they ſtrongly enforced the renewal of thoſe national aſſemblies, which had rendered the reign of Charlemagne ſo great and illuſtrious.

In the year 1789, the ſtates-general were convened for the arrangement of public affairs: they aſſumed the name of the national aſſembly, and among its earlieſt labours was that of forming a new conſtitution. The ſpirit of diſcontent and diſorganization ſeemed to pervade all ranks of the people. They did not wait for leaders of known and tried talents: inſpired with a ſenſe of the wrongs that they and their fathers had long endured from the government, they attacked and deſtroyed what they denominated the great fortreſs of deſpotiſm, the Baſtile. Encouraged by this inſtance of ſucceſs, they proceeded farther, and even reſtrained the actions of the monarch. In a ſhort time, the aſſembly, emboldened by the ſupport given them by the people, proceeded to the abolition of titles, and to the deſtruction of that power which the church had for a long ſeries of years aſſumed. Theſe acts drove from the kingdom a multitude of the higher orders of ſociety, who ſought for the honours of rank and diſtinction in a foreign clime which was denied them at home. Theſe were the emigrants, who for a long time employed all their arts in the various courts of Europe, to induce their reſpective ſovereigns to arm againſt France. The hope of ſucceſs excited ſeveral powers to coaleſce, in order to invade the country. The effect of theſe meaſures rebounded on the head of the monarch, who was ſuſpected of having invited the enemy to make war upon his ſubjects. The firſt ſucceſſes of the allied armies enraged the French almoſt to madneſs, and the neceſſity they were under of defending themſelves inſpired them with an energy which in a ſhort time produced the moſt aſtoniſhing victories. Theſe encouraged the leaders of the public mind to meditate exceſſes, which would otherwiſe ſcarcely have been attempted; and the monarch, foreſeeing the ſtorm, reſolved upon flight, but he was arreſted on his road, and brought back with ignominy amidſt the execrations of the infuriated populace. To avoid the ſentence of abdication he accepted and ratified the conſtitution, before the deputies of France, who were preſent on the occaſion. Different parties were very differently affected by this ill-conducted and unfortunate flight of the king. A republican band had already begun to appear, and during the king's abſence attempts were made to induce the public at large to conſider the royal authority as no neceſſary part of the conſtitution, an idea which, at firſt,

was scouted by every moderate Frenchman, who had been accustomed to believe that the glory of the king was essential to the very existence of the nation. The flight of the sovereign was unquestionably a deep laid plan, as well with respect to the nobility of France, as with foreign courts who were preparing to take advantage of the approaching event. Many of the chiefs among the aristocratic party sent in resignations of their seats in the national assembly. Troops were even levied on the frontiers in the king's name: Bouillé, a great general, emigrated, and afterwards sent to the assembly a furious letter: "You shall answer," says he, "for the lives of the king and queen to all the monarchs of the universe. Touch but a single hair of their heads, and not one stone shall be left upon another in Paris. I know the roads. I will conduct the foreign armies. This letter is but the fore-runner of the manifesto of the sovereigns of Europe." A considerable calm throughout France followed these events, and it might be regarded as in a state of tranquillity: but the calm was delusive, and in the midst of it those projects were formed which were afterwards to prove so fatal to the peace of the world. Towards the close of the summer a convention took place at Pilnitz in Saxony, between the emperor Leopold and the king of Prussia. Its object at the time was unknown, but it was gradually developed, and it has generally been understood to have been intended for the purpose of concluding a league for the invasion of France, the new modelling of its government, and the partition of some of its fairest provinces. The national assembly were not deficient in exertions on their part: they formed a new constitution, and on the 13th of September the king announced his acceptance of it. This event was ordered to be notified to all the foreign courts, and the assembly decreed a general amnesty with respect to the events of the revolution. On the 30th of the same month the assembly, which had been known under the name of the "Constituent assembly," dissolved itself, and gave place to the succeeding legislative body that had been elected according to the rules prescribed by the new constitution.

From this period societies and clubs began to be formed in all parts of the metropolis; but that of the Jacobins, so called from the name of the place where the members assembled, insensibly absorbed all the rest, and for some considerable time dictated the politics of France, and even influenced, if not actually commanded, the decisions of the legislature. Being at length resolved to extort by violence what they were not able to obtain voluntarily, the Jacobins, in conjunction with the municipality of Paris, collected a large concourse of people of all descriptions, and appeared with cannon before the palace. This commotion was unexpected: the king ordered the gates to be opened, and, to calm the violence of the populace, he accepted and placed on his head the red cap, an emblem of the new principles: they retired appeased and apparently satisfied. This was in the month of June, and after that, events succeeded each other with such rapidity, that it would be fruitless in this sketch to attempt an enumeration of them. The legislative assembly was quickly dissolved, and early in August it was determined to elect a National Convention. On the tenth of that month, the sovereign was driven from his palace, and the Thuilleries became the seat of action; a dreadful battle was fought on the very spot from which the royal family had fortunately escaped but an hour before: the king's guards were overpowered, and every human being that could be found in the palace, attached to the court, were instantly put to death. The royal family had taken refuge in the assembly, where for many hours they sat listening to discussions in which themselves and office were treated with every mark of contempt and insult. From this place they were sent to the old palace of the Temple as prisoners, under a strict guard, and all persons attached to them were seized and committed to different prisons.

On the 20th of September the French national convention assembled. It contained men of all characters, orders, and ranks, but the general aspect of it shewed most decidedly that the republican party had acquired a vast superiority, and on the first day of their meeting, Collot d'Herbois, who had formerly been an actor, ascended the tribune, and proposed "The eternal abolition of royalty in France." The question was carried by acclamation, and the house adjourned. On the next day it was decreed that public acts should be dated by the year of the French republic, and all citizens were declared eligible to all vacant offices and places.

It was now determined to bring the king to trial, and on the 11th of December he was conveyed to the bar of the convention, to hear the charges exhibited against him; and though he had no previous intimation respecting their nature, he replied to them with clearness and precision, and with a full consciousness of his own innocence. The trial came on the 26th, when the king appeared for the last time at the bar of the national assembly. The discussion was, however, continued to the 18th of January, when, after a sitting of thirty-four hours, the punishment of death was awarded by the small majority of five. Upon this one of the counsel solemnly invoked the assembly to consider by what a small majority the punishment of death was pronounced against the dethroned monarch. No eloquence could, however, avail; the sentence was ordered to be carried into execution in twenty-four hours. On the 21st of January 1793, the bloody deed was perpetrated, and with Lewis ended the third dynasty of the kings of France, and a monarchy which had lasted without interruption for the long period of eleven centuries. The queen and the king's sister shortly after fell victims to the same ferocity. A mere chronological table of events that have occurred in France from that time to the present would occupy more space than can be devoted to this article: revolution succeeded to revolution, till at length Bonaparte contrived to get himself elected a consul, and then chief consul, in imitation of the office under the ancient republic of Rome. At first this office was to be held for a limited time only, but during that period he contrived to make it not only an office for life, but hereditary in his own family for ever. Not contented with this, he, by degrees, caused the people, who had contended for liberty with infinite slaughter for many years, to proclaim him emperor, with unlimited powers. Invested with this high authority, and having under his controul immense armies and a mighty population, he has gone on from victory to victory, till at length he has subjugated almost the whole continent. The kings of Bavaria, Saxony, and Wirtemberg, have all been raised to that high honour solely by his influence. On the thrones of Westphalia, Holland, and Spain, he has placed three of his own brothers, and on that of Naples, his creature and general, Murat, the late grand duke of Berg. The court of Portugal he has driven for an asylum to South America, and over the republic of the Seven Islands he has placed a president. Prussia has been subdued by the armies of France, and Russia is kept in awe of the same power. Over Italy Bonaparte himself claims the title and power of sovereign, as well as emperor of France, with a population of more than thirty millions of people; and in the course of the last year he annexed the papal territory to his own dominions, and abolished for ever the terrors of the inquisition. With respect to Austria, she has

again

again and again contended with the power of Napoleon, but has always proved unfuccefsful in the arduous conteft. Her prowefs, however, was not to be defpifed by the conqueror, and when he found that he could not completely reduce her to fubjection, he thought upon other meafures to effect his purpofe. With this view, and with the hope of obtaining an heir to his vaft dominions, he, in the month of December 1809, divorced himfelf from the emprefs Jofephine in the prefence of feveral of the crowned heads of Europe, and during the prefent month (April 1810) he has married, with the confent, real or feigned of all parties, the daughter of the emperor of Auftria, with whom, of courfe, he has made an alliance of perpetual peace and amity.

Such has been the conduct of the emperor Napoleon Bonaparte, by birth a poor Corfican, but by his fortune or talents he has rendered himfelf the firft man that has ever lived in the world. To attain this exalted fituation he has not been very particular in the choice of means to effect his ambitious projects. He has never fcrupled to refort to defpotic meafures when thofe were likely beft to anfwer his ends; but in no inftance has the tyrant fhewn itfelf more than in one of his lateft acts. The French nation in 1789 were contented to fhed their beft blood to deftroy the accurfed baftile; in March 1810 they have feen, without a murmur, their emperor erect eight baftiles to confine perfons avowedly, " whom it is not convenient to bring to trial or to fet at liberty." Yes, thefe infernal dungeons are fcattered about the empire to keep the people in awe of a power, which already they dare not openly oppofe, and to fhut the mouths of thofe from whofe hands the pen has long fince dropped. The vile decree indeed, afferts, " that many of thefe ftate prifoners might be condemned by the tribunals to capital punifhments, but that fuperior confiderations oppofe their being brought to trial; that feveral are men accuftomed to crimes, but who cannot be condemned by our courts, though they have the certainty of their culpability; that fome belong to different countries, which have been united to France, but that they cannot be tried, becaufe their offences are either political or anterior to the union of thefe ftates." To fo low, fo degrading a ftate, is perfonal liberty brought in France; how debafed muft a people be to fubmit to fuch a decree, and under fuch frivolous pretences! Univerfal Hiftory. Playfair's and Blair's Chronology. Hiftoire de France. Gibbon's Hiftory. Rabaut's Hift. of the Revolution, &c.

France is fituated within the eighth geographical climate. The length of the longeft day at Paris is of fixteen hours. Its temperature is, generally fpeaking, healthy and moderate. The moft careful meteorological obfervations give for the centre of France an average of 27 degrees of Reaumur's thermometer for the greateft heat, and feven for the leaft. The greateft height of mercury in the barometer is 28° 5′ 7″, the leaft 27° 3′ 3″. The quantity of rain 20° 2′ 4″. There are 164 rainy days. The prevailing winds are the fouth-weft and north-eafterly wind.

In the north of France the greateft heat is 23° 2′, the leaft 6 6; the greateft height of mercury in the barometer 28° 8′ 3″, the leaft 27° 1′ 4″. There are 126 rainy days. The prevailing wind blows from the fouth-eaft.

In the eaft of France the greateft heat is 24° 3′, the leaft 9° 5′. The greateft height in the barometer 27° 10′ 10″, the leaft 26° 8′ 5″. There are 145 rainy days. The north and fouth-weft are the prevailing winds.

In the weft of France the greateft heat is 24°, and the leaft 6°, the average height of mercury in the barometer is 28° 3′. There are 150 rainy days, and the north-eaft is the prevailing wind.

In the fouth-eaft, at Montpellier, the greateft heat is 28° 1′, the leaft 3° 7′; the greateft height of mercury in the barometer 28° 5′ 3″, the leaft 27° 5′ 5″. The quantity of rain 27° 8′. There are 74 rainy days, and the north and north-eaft are the prevailing winds.

At Marfeilles the meteorological obfervations of nine fucceffive years give an average of 25° 3′ for the greateft heat, and 3° 1′ for the leaft. The greateft height of mercury in the barometer is 28° 7′ 2″, the leaft 27° 3′ 7″. The quantity of rain is 21° 10′ 2″. There are 57 rainy days. The prevailing winds blow from the fouth-eaft and north-weft.

The foil of France varies very much in different parts of that extenfive country. Mr. Arthur Young, in his journey through France in the years 1787, 1788, 1789, and 1790, obferved feven different kinds of foil, *viz*:

a, a fat and rich foil, prevailing chiefly in the departments of Mont Tonnerre, of the Lys, the Scheldt (l'Efcaut), the Pas de Calais, the North, the Aifne, Seine and Marne, Seine, Seine and Oife, Eure and Loire, Eure, Lower Seine, Somme, l'Oife, Lower Rhine, Aude, Tarn, Lot, Upper Garonne, Hérault, Vendée, Two Sèvres, Loiret, Pô, Marengo, Tanaro, and Sefia.

b. Heath and downs (landes), prevailing in the departments of the Two Nethes, the Roër, Lower Loire, Morbihan, Finifterre, Côtes du Nord, Ille et Vilaine, Mayenne and Loire, Orne, Calvados, La Manche, Gironde, Dordogne, Lot and Garonne, Arriège, Upper Pyrenees, Lower Pyrenees, Landes, Gers, Aveyron, and Gard.

c. Marl (Terres à craie), prevailing in the departments of the Marne, the Ardennes, Aube, Upper Marne, Loire and Cher, Indre and Loire, Charente, Lower Charente, and Vienne.

d. Gravel (Terres de gravier), prevailing in the departments of the Nièvre, and the Allier.

e. A flinty foil (Terres pierreufes), prevailing in the departments of the Sarre, the Forêts, Rhine and Mofelle, Mofelle, Vofges, Meurthe, Meufe, Upper Rhine, Côte d'Or, Upper Saône, Doubs, Saône and Loire, Jura, Ain, Yonne, Rhône, Loire, and Jemmapes.

f. A rocky foil (Terres de montagnes), prevailing in the departments of the Ourte, of the Sambre and Meufe, Lower Meufe, Eaftern Pyrenees, Lozère, Cantal, Corrèze, Upper Loire, Ardèche, Drôme, Upper Alps, Lower Alps, Maritime Alps, Var, Mouth of the Rhône, Vauclufe, Puy de Dôme, Mont Blanc, Léman, Ifère, Liamone, Dolo, Stura, and Doire.

g. A fandy foil, prevailing in the departments of the Indre, Cher, Creufe, Upper Vienne, Sarthe, and Mayenne.

Or, taking the whole fuperficies of France, without Genoa, Tufcany, and the former papal dominions at 61,258,782,06 hectares, there may be reckoned,

For arable lands	-	33,219,437,40 hectares
Vine lands	- -	2,434,365,64.
Woods	- -	8,134,716,26.
Meadows	- -	3,302,033,92.
Artificial meadows	-	3,745,303,84.
Heaths, downs, wafte lands,		
Rivers, ponds, marfhes, &c.		10,422,925,00.

Before the revolution of 1789, France was divided into thirty-two governments, *viz*. Picardy, Artois, Flandres, Normandy, Ifle de France, Champagne, Lorraine, Alface, Bretagne, Maine, Anjou, Touraine, Orléanois, Berry, Nivernois, Bourgogne; Franche Comté, Poitou, Aunis,

La

La Marche, Le Bourbonnois, Saintonge et Angoumois, Limosin, Auvergne, Lyonnois, Dauphiné, Guienne et Gascogne, Béarn, Comte de Foix, Rouſſillon, Languedoc, and Provence. Beſides theſe thirty-two governments, which were ſtyled great governments, there were eight leſſer ones of ſmall extent, *viz.* Paris, the Boulonnois in Picardy; the Havre de Grace in Normandy; Saumur, between Anjou, Touraine, and Poitou; Metz and the Pays Meſſin; Verdun, and the Verdunois; Toul and the Toulois, all three ſituated in Lorraine, and known by the name of the three biſhoprics; and laſtly Sedan, between Lorraine and Champagne in the north.

In financial and civil matters, France was divided into twenty generalties for the Pays d'Election, and five for the Pays d'Etat, and eight intendancies, making in all thirty-three financial and civil departments, with only thirty-two intendants, becauſe there was only one intendant for the two generalties of Languedoc.

The eccleſiaſtical diviſions of France, at the ſame period, were eighteen archbiſhoprics and 112 biſhoprics, beſides the archbiſhopric of Avignon for the comtat Venaiſſin, which belonged to the pope, and which counted three biſhoprics. There were alſo ſix biſhops ſuffragans of two German archbiſhops, *viz.* Straſburg ſuffragan of Mentz or Mayence, and Metz; Toul, Verdun, Nancy, and Saint Diez ſuffragans of Treves. The number of pariſhes in France at that time was 40,000. There were 800 convents of monks, 281 nunneries, and 679 chapters.

The decree of the national aſſembly of the 12th of July 1790, reduced the archbiſhoprics to 10, and the biſhoprics to 83. But in conformity with the concordat concluded on the 25th of July 1801, between the French conſular government, and the pope Pius VII., a new eccleſiaſtical diviſion was adopted by the law of the eighth of April 1802, which eſtabliſhed 10 archbiſhops and 51 biſhops, *viz.* 1. The archbiſhop of Paris, who has under him the biſhops of Troyes, Amiens, Soiſſons, Arras, Cambray, Verſailles, Meaux, and Orleans. 2. The archbiſhop of Malines, who ſuperintends the biſhoprics of Namur, Tournay, Aix la Chapelle, Treves, Gand, Liege, and Mayence. 3. The archbiſhop of Beſançon, who has under him the biſhops of Autun, Metz, Straſburg, Nancy, Dijon. 4. The archbiſhop of Lyons, who ſuperintends the biſhoprics of Mende, Grenoble, Valence, and Chambéry. 5. The archbiſhop of Aix, who has under him the biſhops of Nice, Avignon, Ajaccio, Digne, and Vintimille in the principality of Piombino annexed to France. 6. The archbiſhop of Toulouſe, who ſuperintends the biſhoprics of Cahors, Montpellier, Carcaſſonne, Agen, and Bayonne. 7. The archbiſhop of Bourdeaux, who has under him the biſhops of Poitiers, La Rochelle, and Angoulême. 8. The archbiſhop of Bourges, who ſuperintends the biſhoprics of Clermont, Saint Flour, and Limoges. 9. The archbiſhop of Tours, who has under him the biſhops of Le Mans, Angers, Nantes, Rennes, Vannes, Saint Brieux, and Quimper. 10. The archbiſhop of Rouen, who ſuperintends the biſhoprics of Coutances, Bayeux, Séez, and Evreux. To theſe muſt be added for the countries that have ſince been annexed to France; 11. The archbiſhop of Turin, who has under him the biſhops of Acqui, Aſti, Caſal, Ivrée, Mondovi, Saluces, Verceil. 12. The archbiſhop of Genoa with the biſhops of Albenga, Borgo ſan Donino, Brugnetto, Parma, Plaiſance, Sarzanne, Savonne, and Pontremoli; and, 13. The archbiſhop of Rome.

The firſt national aſſembly of France, by its decrees of the 15th of January, and 16th and 26th of February 1790, divided France into 83 departments, ſubdivided into 544 diſtricts. But the conqueſts of France having conſiderably increaſed its territory, the number of departments was extended to 102, by a law of the year 1800, and that of diſtricts reduced to 417; when a prefect was placed at the head of the civil adminiſtration of each department, and a ſub-prefect eſtabliſhed for every diſtrict.

In 1807 the number of departments, owing to the annexation of the Ligurian or Genoeſe republic and other territories, was 110, *viz.* 1, Lower Alps; 2, Mouth of the Rhône; 3, Var; 4, Vaucluſe; 5, Upper Alps; 6, Drôme; 7, Iſere; 8, Doubs; 9, Jura; 10, Upper Saône; 11, Lower Rhine; 12, Upper Rhine; 13, Meurthe; 14, Meuſe; 15, Moſelle; 16, Voſges; 17, Ardennes; 18, Aube; 19, Marne; 20, Upper Marne; 21, North; 22, Pas de Calais; 23, Aiſne; 24, Oiſe; 25, Seine; 26, Seine and Oiſe; 27, Somme; 28, Seine and Marne; 29, Calvados; 30, Eure; 31, Manche; 32, Orne; 33, Lower Seine; 34, Côtes du Nord; 35, Finiſtère; 36, Ille and Vilaine; 37, Lower Loire; 38, Morbihan; 39, Indre and Loire; 40, Mayenne; 41, Mayenne and Loire; 42, Sarthe; 43, Two Sèvres; 44, Vendée; 45, Vienne; 46, Eure and Loire; 47, Loire and Cher; 48, Loiret; 49, Indre; 50, Cher; 51, Nièvre; 52, Ain; 53, Côte d'Or; 54, Yonne; 55, Saône and Loire; 56, Loire; 57, Rhône; 58, Allier; 59, Corrèze; 60, Creuſe; 61, Upper Vienne; 62, Charente; 63, Lower Charente; 64, Dordogne; 65, Gironde; 66, Landes; 67, Lot and Garonne; 68, Gers; 69, Lot; 70, Aveyron; 71, Lower Pyrenees; 72, Upper Pyrenees; 73, Arriège; 74, Eaſtern Pyrenees; 75, Ardèche; 76, Aude; 77, Gard; 78, Upper Garonne; 79, Herault; 80, Lozère; 81, Tarn; 82, Cantal; 83, Upper Loire; 84, Puy de Dôme; 85, Golo; 86, Liamone; 87, Mont Blanc; 88, Maritime Alps; 89, Leman; 90, Dyle; 91, Eſcaut (Scheldt); 92, Forêts; 93, Jemmappe; 94, Lys; 95, Lower Meuſe; 96, Two Nèthes; 97, Ourthe; 98, Sambre and Meuſe; 99, Roër; 100, Sarre; 101, Rhine and Moſelle; 102, Mont Tonnerre; 103, The Apennines; 104, Doire; 105, Genoa; 106, Marengo; 107, Montenotte; 108, Po; 109, Seſia; 110, Stura. To which muſt be added for Parma and Plaiſance, Tuſcany, the papal dominions, and a new department formed out of different cantons of the departments of Aveyron, Upper Garonne, Gers, Lot, and Lot and Garonne by the ſenatus conſultum of the 2d of November 1808, the departments of, 111, Tarn and Garonne; 112, Taro; 113, Arno; 114, Mediterranean; 115, Ombrone; 116, Rome; and, 117, Traſimene.

The military diviſions of France are twenty-nine, each of which is commanded by a general of diviſion, *viz.*; 1, Paris; 2, Mezières; 3, Metz; 4, Nancy; 5, Straſburg; 6, Beſançon; 7, Grenoble; 8, Marſeilles; 9, Montpellier; 10, Toulouſe; 11, Bourdeaux; 12, Nantes; 13, Rennes; 14, Caen; 15, Rouen; 16, Lille; 17, Dijon; 18, Lyons; 19, Périgueux; 20, Bourges; 21, Tours; 22, Baſtia; 23, Bruſſels; 24, Liège; 25, Mayence; 26, Turin; 27, Genoa; 28, Florence; 29, Rome.

Beſides the important natural advantages of a large extent of country, enjoying an extenſive ſea-coaſt on three different ſeas, of a highly centrical and commercial ſituation, of limits fixed by the boldeſt features of nature, three chains of high mountains, three ſeas, and a large river; of a moſt favourable climate, excellent ſoil, and advantageous topographical diviſions; France enjoys the advantage of being irrigated by ſeven great rivers, the Rhine, the Rhône, the Maes, the Scheldt, the Seine, the Loire, and the Garonne, and interſected by more than 7000 leſſer ones. Its principal lakes are, 1, the lake of Geneva, in the department of the Léman, now called lac Leman, about twenty-nine leagues long and four leagues broad in its greateſt breadth; 2, the lake of

Annecy, in the department of Mont Blanc, four leagues long; 3, the lake of Bouget, in the fame department; and, 4, the lake of Allègre, at the top of a mountain in the department of the Puy de Dôme.

Of the mountains of France, the moft remarkable are that chain of the Alps which croffes the three departments of the Maritime Alps, Lower Alps, and Upper Alps, afterwards ftretches to the north, and divides France from the kingdom of Italy and Switzerland. Some of the fummits of the Alps are 2700 fathoms, (toifes,) or 5260 metres above the level of the fea. A lefs elevated branch of the Alps begins in the department of the Leman, ftretches into the departments of the Jura, Upper Saône, Doubs, Upper Rhine, Vofges, Lower Rhine, Meurthe, Mofelle, Sarre, and Mont Tonnerre. A third branch rifes in the department of the Drôme, croffes the departments of the Ardêche, Loire, Rhône, Saône and Loire, and Côte d'Or as far as Dijon. It has alfo fome ramifications in the departments of the Cantal and Puy de Dôme, extends itfelf to the fouth-weft through the departments of the Upper Loire, Lozère, Gard, Aude, Hérault, Tarn, Upper Garonne, and Arriège as far as the Pyrenees, which form a natural boundary between France and Spain. This chain of the Pyrenees ftretches to the fouth of France, from the port of Vendres on the coaft of the Mediterranean fea to the Atlantic ocean on the coafts of Spain. Its greateft breadth is 40 leagues, and its higheft fummit 1442 fathoms, (toifes,) or 2808 metres above the level of the fea.

France abounds in woods and forefts. A committee of the firft national affembly ftated the whole extent of territory covered with wood at 13,100,691 arpens, of 100 perches of 28 fquare feet French each. Mr. Neckar and Mr. Arthur Young have both confiderably over-rated it by ftating it at 22,289,016 arpens. This eftimate may however be tolerably correct now, with the addition of the conquered countries.

The roads of France are generally fpacious, ftraight, well paved, planted on both fides with chefnut-trees, poplars, walnut, mulberry, or other fruit-trees. There are twenty-eight principal roads from Paris to the boundaries of France. Turnpike-gates and tolls have been eftablifhed fince the revolution, at the diftance of five kiliometres from each other. The duty is 15 centimes, about $1\frac{1}{2}$*d.* fterling for every coach-horfe, and 10 centimes, about 1*d.* for a faddle-horfe. The wheels of heavy waggons are nine inches three lines broad. They are allowed to carry only a certain weight, which varies during the five winter and the feven fummer months.

Of the numerous canals of France, the moft confiderable are, 1, the fouthern canal, better known by the name of the Canal du Languedoc. It forms a communication between the Atlantic ocean and the Mediterranean fea; 2, the canal of Briare and Orléans, thus called becaufe it forms a communication between the Seine and Loire, which begins at Orléans and ends at Briare; 3, the eaftern canal, known by the name of Canal de la Côte d'Or, and forming a communication between the Yonne and Saône; 4, the canal of the center, formerly called Canal du Charolais, which forms a communication between the Saône and Loire.

France has no dependencies in Europe but the kingdom of Italy, which is, however, to lofe its connection with the French empire after the demife of the prefent emperor Napoleon I., who is at the fame time king of *Italy* (which fee). Still the ftates of the Confederation of the Rhine, and the kingdoms of Naples and Holland, as well as the Helvetic union, of which the French emperor is the mediator, are little better than dependencies or vaffal ftates, forced to move in the direction to which they are impelled by France.

But, if France has been a gainer in its own immediate neighbourhood, it has experienced fevere loffes in its diftant colonies. The fate of its moft important Weft India iflands has already been detailed under the article *St. Domingo* (which fee). All the other French Weft India iflands, which were acknowledged as belonging to France by the treaty of Amiens of the 25th of March 1802, have been conquered by the Englifh in the courfe of the war which broke out in 1803, and which is ftill (1810) raging. They were *La Martinique*, *Guadaloupe*, *St. Lucia*, *Tobago*, *Marie Galante*, *La Defirade*, *Les Saintes*, (which fee). Cayenne, on the South American continent, has fhared the fame fate. The poffeffion of the two iflands in the Eaft Indian feas, Mauritius and Bourbon, called by the French Ifles de France, and de la Réunion, is not lefs precarious, the latter having been recently invaded by the Englifh, and the former being at this moment clofely blockaded. The other commercial eftablifhments of the French in the Eaft Indies and on the African coaft were never of any great importance, and have dwindled into complete infignificance, through the lofs of their foreign commerce in general, and of their fugar colonies in particular, which were fupplied with negroes from the Guinea coaft. See Indies, and Negroe, or Slave *Trade.*

The fifheries of France have alfo materially fuffered from the war with England. The herring fifhery was already on the decline before the revolution, and is now almoft annihilated. In the fhort interval of peace in 1802 it produced

	49,550	barrels of	falt herrings.
	6,000	-	frefh
	12,000	-	red
making in all	67,550	barrels.	

The mackarel fifhery, which was moft flourifhing in 1785, is in the fame predicament. Oyfters are in abundance at Granville, Dieppe, and Cancale. During the fhort interval of peace in 1802, 188 Englifh veffels loaded at Cancale 119,473,000 oyfters, worth 179,209 French livres. Paris confumes about twelve millions of oyfters annually. There is a coral fifhery in the Mediterranean. The coral is polifhed and wrought at Marfeilles. It ufed to be employed moftly in the African trade. The commerce of anchovies in the Mediterranean fea is ftill confiderable. They are pickled at Fréjus, St. Tropez, and Cannes. The falt is coloured red with ochre. Eels are alfo falted for exportation. There is a great abundance of all forts of fifh in all the rivers of France, and in fome very extenfive fifhponds, fuch as the Etang de Villers in the department of the Cher, which is fix leagues in circumference, and the Etang de l'Indre in the department of the Meurthe, which is four leagues in circumference.

Situated nearly in the centre of Europe, France owes to its foil, and to the excellence of its climate, the advantage of rearing alike the plants of the moft fouthern countries of Europe, and thofe which fucceed more particularly in the north. In the eaftern Pyrenees the vine is cultivated with as much fuccefs as in Spain. Silk-worms are reared in the fouth of France with as much fuccefs as in Italy, and the olive oil of Aix is preferred all over Europe to that of Genoa and Sicily. Though the agriculture of France cannot be praifed as good, it yet is amply adequate to furnifh the country with all the objects of firft neceffity, food, cloathing, and fhelter againft the inclemencies of the weather.

Among the vegetable productions of France, the moft confiderable are,

1. Corn, under the general denomination of which are comprifed

comprifed wheat, rye, barley, and oats. Its annual produce, before the revolution, was rated

by Vauban at	59,175,000	fétiers of 12 Paris bufhels, or 240lb. weight.
by Quefnay at	45,000,000	
by the Abbé d'Expilly at	78,473,380	
by Lavoifier at	50,000,000	
by Mr. Arthur Young at	75,000,000	
	307,648,380	

the average of which fum gives 61,519,672 fétiers.

The price of wheat generally varies from 25 to 35 French livres the fétier.

2. Wine. Before the revolution of 1789, France, according to Mr. Arthur Young, cultivated the vine on an extent which conftituted nearly the twenty-fixth part of its territory, and grapes formed the fixth part of its produce. Of 130 millions of acres, five millions were covered with vines, which, at the average produce of 175 French livres per acre, yielded 875 millions. The fame line of demarcation which that intelligent agriculturift traced at that time for the growth of the vine is ftill correct. France has not changed in that refpect fince 1787, and is not likely to change. The annual average produce may be eftimated at 15,000,000 muids of Paris, of 144 quarts each, or 540 millions of Englifh gallons. The beft French wines are thofe of Burgundy, Champagne, Bourdeaux, Anjou, Orléans, and Poitou.

In the beginning of the laft century France exported, upon an average of five years, from the year 1720 to 1725, annually, wine to the amount of 20,880,200 French livres.

In 1778 the exportation amounted to	24,570,170	——
In 1788 - - -	33,032,100	——

Of brandy, the exportation in the beginning of the laft century amounted annually to 5,852,900 livres.

In 1778 - - -	4,660,221	—
In 1784 - - -	11,360,200	—
In 1787 - - -	14,689,600	—
In 1788 - - -	14,657,300	—

Of vinegar, the exportation in the beginning of the laft century amounted annually to 34,400 livres.

In 1778 - - -	141,893	—
In 1784 - - -	124,400	—
In 1787 - - -	130,900	—
In 1788 - - -	201,700	—

3. Hemp and flax, but neither in fufficient abundance for its own confumption.

4. Rape and poppy feed, which furnifh excellent lamp-oil, chiefly in the northern departments.

5. Indian corn and buck-wheat.

6. Madder, tobacco, and hops.

7. All forts of pulfes, roots, pot-herbs, greens, graffes, and an immenfe variety of medicinal plants.

8. All forts of the fineft fruits, as lemons, oranges, chefnuts, olives, &c.

Attempts have alfo recently been made at introducing the culture of indigo and cotton. A report of the municipality of Lille, in the department of Vauclufe, confirmed the fuccefs of a plantation of indigo upon a large fcale, in an open field, on part of the eftate of Mr. Icard de Bataglini, and on fome of the heaths (landes) of France. Mr. Louis Dupoy, a colonift of St. Domingo, at prefent comptroller of the cuftoms at Dax, has fuccefsfully introduced the culture of cotton; he provided himfelf with feeds proper for the experiment in Louifiana. Very fine cotton has been produced, and the pods have attained perfect maturity.

Among the principal animal productions of France are,

1. Horfes, which have, however, confiderably degenerated fince 1789; the public fheds having long been neglected, a vaft confumption occafioned by continual wars, and a wilful deterioration introduced by the farmers to fave their cattle from the revolutionary requifitions. In the year 1802 the total number was,

Of plough horfes - -	1,500,000
Horfes kept at Paris -	35,100
In all the other towns -	200,000
In the armies - -	100,000
	1,835,100

2. Oxen and cows, *viz.*

Oxen employed in hufbandry -	3,208,000
—— feeding - - -	404,500
Young oxen - - - -	1,456,000
Cows - - - - -	1,016,000
	6,084,500

3. Sheep, which are improved from the Spanifh flocks of Rambouillet, Perpignan, Croiffy fur Seine, Dun fur Auroux, and Montbar. Their number in 1802 was 30,307,728, one million of which were in the moft improving condition. The common fleeces weigh 3lb. each; thofe of the improved breed from 6 to 8lb. The total of the wool they yield may be rated at 106,770,048lb. This fupply is, however, infufficient for the manufactures when they are in full activity. There are alfo great numbers of goats, mules, affes, and hogs. Poultry is uncommonly abundant. The average price of a good fowl is 10*d.*; of a pigeon 3*d.*; of a duck 1*s.*; a goofe 2*s.*; a turkey 2*s.* 9*d.* Bees are carefully reared. The beft honey is that of Narbonne.

France is very rich in mineral productions. They have been confiderably increafed by the diftrefs to which it was reduced in 1792, 1793, and 1794, by the coalition of all the great powers of Europe.

1. Of the pure metals iron is the moft abundant. Two thoufand forges fupply the wants of the country, which before the revolution was obliged to import iron to the annual value of from 11 to 12 millions of French livres.

The principal copper mines are in the departments of the Rhône, the Upper Pyrenees, and the Upper Alps.

Of the few lead mines that are worked moft yield filver at the fame time.

The principal mines of mercury and calamine are in the departments of the Ourte and Roër. Antimony and manganefe are in great abundance.

2. Of metallic falts France has green, white, and blue copperas; verdigris chiefly at Montpellier; alum, Epfom-falt, in the neighbourhood of Liège; marine falt (foud muriatée) faltpetre, and fal ammoniac.

3. Of the mineral acids France has the moft important, *viz.* the fulphuric acid, or oil of vitriol, the nitric acid, or aqua fortis, and the muriatic oxygenated acid.

4. Of the combuftible minerals France has pit-coal in abundance, chiefly in the departments of Jemmappe, Sarre, Lower Meufe, Roër, North, Calvados, Loire, Upper Loire, Hérault, and Tarn. Some anthracites in the Pyrenees and in the department of the Rhône. Jet in the departments of the Aude, Gard, and Ardèche. Solid bitumen, called

called aſphaltum, chiefly in the departments of Ain and the Lower Rhine. Glutinous bitumen, called piſaſphaltus, in the department of Puy de Dôme. Liquid bitumen, called naphtha and petroleum, in the departments of the Hérault and the Lower Pyrenees. Turf chiefly in the departments of the Somme, North, and Pas de Calais.

All ſorts of earths and ſands uſed in manufactures, as kaolin, or porcelain earth, arenaceous quartz, puzzolane, &c. and all kinds of ſtony ſubſtances employed in the arts, abound in France, from the maſſy rock that forms the ſtately column, to the gem that ſparkles on the neck of beauty.

The principal manufactures of France are thoſe

1. Of linen cloth, in the departments formed out of the ancient provinces of Normandy, Picardy, Flanders, Hainaut, Cambréſis, Bretagne, Maine, Dauphiné, Auvergne, Beaujolais, Gaſcogne, and Anjou. Before the revolution France exported linen cloth to the amount of from 12 to 13 millions of livres.

2. Of lawn and cambric, the exportation of which amounted to about ſix millions of livres.

3. Of thread lace, chiefly at Bruſſels, Malines, Valenciennes, Dieppe, and Le Puy.

4. Of ſail cloth, chiefly at Rennes, Angers, Agen, Marſeilles, Mont de Marſan, &c.

5. Of cables and ropes at Breſt, Rochefort, Toulon, Abbeville, Dunkirk, and Havre de Grace.

6. Of printed calico, ſhawls, ſiamoiſes, &c. at Rouen, Troyes, Darnetal near Rouen, Beauvais, Langres, Crevelt.

7. Of muſlin at Rouen, Niſmes, Geneva, Béziers, Rheims.

8. Of dimity and fuſtian of a ſuperior quality at Alençon, Lyons, Troyes, Bruſſels, and Toulouſe.

9. Of writing and printing paper at Annonay, Montargis, Eſſonne, Courtalin, Rambervilliers, Dynoſée, Arches, Archettes, Docelles, St. Breſſon near Luxeuil, Beſançon, Ornant, Villafant, Arbois. Paper-hangings at Paris in the manufactures of Réveillon, Arthur, and others. They are exported to Italy, Holland, Germany, and as far as Ruſſia. Before the revolution the paper manufactured in France amounted to the annual value of 8 millions, 1,350,000 livres of which were exported to foreign countries, and 350,000 livres to the French colonies. Paris alone conſumes annually 305,000 reams.

10. Of ſoap of the firſt quality at Marſeilles, inferior ſoap at Toulon, Bourdeaux, Rouen, Nice, Lille, Abbeville, Amiens, St. Quentin. The amount of this manufacture is 60 millions, two of which only are exported.

11. Of ſtarch, the principal manufacture of which is at Paris.

12. Of tobacco and ſnuff, *viz.* 22,000 cwt. of ſnuff, and 2000 cwt. of tobacco. Every individual in France is ſuppoſed to uſe on the average 12 ounces of ſnuff annually.

13. Of fine woollen cloth, chiefly at Sédan, Abbeville, Louviers, Elbeuf, Rouen, Darnetal, les Andélys, Vienne, and Montauban. Common woollen cloth is made at Chateauroux, Iſſoudun, Aubigny, Romorautin, St. Aignan, Roybon, Creſt, Saillans, Romano, Grenoble, Valence, Valogne, Amboiſe, Niort, Aix, Apt, the Cévennes, &c. Woollen ſtuffs, as camelots, baracans, ſerges, calamancoes, and pluſh, are are alſo manufactured in great quantities. In 1784 France exported

Cloth amounting in value to	-	15,530,900 livres.
Stuffs - - - -	-	7,600,600
Pluſh, &c. - - - -	-	4,425,100

The exportation of the two firſt articles in 1787 amounted to 14,242,400, and 5,615,800 livres. The produce of the whole woollen manufacture was rated in 1789 at 140 millions annually.

14. Of ſilks, chiefly at Lyons, Tours, Niſmes, Paris, and Marſeilles. This manufacture has, however, declined ſince the revolution. In 1789 its produce was rated at 125 millions, and it employed from 28 to 30,000 looms. The ſilk-worms reared in France yield 15,000,000lbs. of ſilk annually; but this quantity is not ſufficient for the manufacture.

15. Of hats chiefly at Lyons, Rouen, and Paris.

16. Of watches at Paris, Geneva, Cluſe, and Carouges. The number of watches conſumed annually in France before the revolution was ſuppoſed to amount to 200,000.

17. Of jewellery, which at Paris and Lyons only employed nearly 70,000 workmen before the revolution.

18. Of cannons and all ſorts of arms. This manufacture has been conſiderably improved, and attracts the particular attention of government.

19. Of china, (chiefly at Sèvres,) glaſs, and mirrors. This manufacture is alſo carried to a high degree of perfection, and the ſame may be aſſerted of the manufacture.

20. Of carpets and tapeſtry. The tapeſtry manufactures at La Savonnerie and Beauvais, though not equal to the celebrated manufacture of the Gobelins at Paris, are very little inferior to it.

The inland trade of France, like that of all extenſive, populous, and induſtrious countries, was at all times far ſuperior to its foreign commerce. It reſults from the conſumption of the produce of its own fiſheries, mines, agriculture, and manufactures, and its circulation from one province to the other. The foreign commerce of France, compriſing its exports of the produce of French induſtry and French colonies, and the importation of foreign commodities, is almoſt annihilated by the war with England. In 1787 the exportation amounted in all to 542,604,000 livres, of which 311,472,000 livres were the raw produce of the ſoil, mines, and fiſheries, and 231,132,000 the produce of French manufactures. In 1800 it amounted only to 271,564,000 livres in all, *viz.*

Raw produce and wines	- -	87,562,000
Metals, minerals -	- - -	4,530,000
Manufactured goods	- - -	140,854,000
Divers other articles	- - -	38,618,000

The imports of France, upon an average of the years 1785, 1786, and 1787, were 611,008,200 livres. But Mr. Roland, in his report to the convention in 1792, ſtated the average imports of France to amount to no more than 319 millions. In 1800 they amounted to 325,116,000 livres.

According to Mr. Neckar the balance of commerce in 1784 was 70 millions of French livres in favour of France. He calculated the imports at 230 millions annually, and the exports at about 300 millions. But from the ſtate of the French commerce in 1787, which Mr. Arnould has analyſed with much care, it appears that

the importation, amounting to		611,008,200 livres, and
the exportation only to	-	542,604,000
there was a balance of	-	684,042,200 livres

againſt France. And in the year 1800, when

the importation amounted to		325,116,000 livres, and
the exportation only to	-	271,564,000
there was ſtill an unfavourable balance of	- -	53,552,000 livres.

A very

A very inconſiderable part of the French trade is carried on in French ſhips. Colbert was the firſt miniſter of ſtate in France who directed his particular attention to the encouragement of the French merchant navy, which in the year 1669 did not count above 600 veſſels; and it is ſuppoſed that in the beginning of the 18th century this number had not been increaſed to much beyond 800 veſſels of from 100 to 250 tons. From that period, however, to the revolution of 1789, the French merchant navy had been conſiderably improved and greatly encouraged. Yet even at that time, though the French trade in the Baltic employed 705 veſſels, there were ſcarcely 100 French among them; and in 1788 all the ports of France had not above 1000 merchantmen of the average of 250 tons employed in long voyages to both the Indies, and in the cod and whale fiſheries. The exports to different countries in Europe took up about the ſame time 580,000 tons, of which a little better than a fourth, or 152,000 tons, were French.

From an official report made by Roland to the national convention in 1793, it appears that in the year 1792 there entered inwards into the ports of France 7607 veſſels, amounting in all to 639,235 tons; of which

1823 veſſels, or	147,821	tons, were	French,
1940 -	- 145,012	-	- English,
3844 -	- 346,402	-	- belonging to

other nations. And in the ſame year there cleared outwards 8618 veſſels, amounting in all to 544,935 tons, of which

1940 veſſels, or	147,410	tons, were	French,
3111 -	- 90,662	-	- Engliſh, and
3567 -	- 306,863	-	- belonging to ſe-

veral other nations.

The money in circulation in France in the year 1789 was ſtated by Mr. Bonvallet Deſbroſſes in his "Tableau des Richeſſes de la France," at 2,474,254,960 livres, 350 millions of which conſiſted in notes of the Caiſſe d'Eſcompte.

In the maritime departments the circulating medium amounted to 1,053,838,350 livres, and the buſineſs tranſacted by its means to 4,485,600,000 livres. In thoſe on the boundaries of France the money in circulation amounted only to 385,227,000 livres, and the buſineſs done with it to 453,600,000. In the central departments the circulating medium was 1,035,189,600 livres, and the trade carried on with it amounted to 11,874,600,000 livres; this more animated circulation ariſing entirely from the trade of the metropolis.

The ſtandard coin of France is a piece of ſilver of the weight of five grammes, or five times 18 $\frac{841}{1000}$ grains, containing a tenth of alloy and $\frac{9}{10}$ of pure ſilver, and very nearly the 24th part of the pound ſterling's metallic value. It is called a franc, and ſubdivided into décimes and centimes. Its value is to that of the ancient livre Tournois in the proportion of 81 to 80, or as it contains $\frac{9}{10}$ of fine ſilver, it is equal to 1 livre, 3 deniers. There are pieces of 5 francs, 2 francs, $\frac{3}{4}$, $\frac{1}{2}$, and $\frac{1}{4}$ franc. The decime is the tenth part of a franc. It is equal to 2 ſous, $\frac{3}{10}$ deniers. The centime is the hundredth part of a franc, equal to 2 $\frac{43}{100}$ denier. The gold coins, like the ſilver coin, contain $\frac{1}{10}$ of alloy, and $\frac{9}{10}$ of pure metal. They are called Napoleons d'or, or octogrammes. An octogramme of gold is worth 25 francs. The kiliogramme of gold, which is the premium awarded by the national inſtitute for the beſt anſwer to its prize queſtions, is valued at 3375 francs. The towns which have mints where money is coined are diſtinguiſhed by a particular letter on the coin. Paris has the letter A; Perpignan, Q; Bayonne, L; Bourdeaux, K; Nantes, T; Lille, W; Straſburg, BB; Lyons, D; Geneva, G; Marſeilles, ; Turin, C.

The preſent bank of France was eſtabliſhed in 1801, with a capital ſtock of thirty millions of francs in hard caſh, made up of thirty thouſand ſhares of a thouſand francs each, which makes each ſhare equal to 1012 livres Tournois. The law of the 22d of April, 1806, inſures to this bank an excluſive privilege of forty years, to be reckoned from the 22d of September, 1803, for iſſuing notes payable to the bearer and at ſight. Its operations conſiſt in diſcounting, (but only twice in the week, Mondays and Thurſdays,) keeping the caſh of public eſtabliſhments and private individuals, and receiving depoſits of ſums not below fifty francs, for which it gives recognizances bearing intereſt, and made payable either to the bearer or to order. Its general aſſembly is compoſed of 200 holders each of five ſhares or above, who elect fifteen directors and three cenſors. Both the directors and cenſors muſt be holders of at leaſt thirty ſhares. Three of the directors and one of the cenſors go out annually by rotation. The general aſſembly meets once in the year to audit the accounts. The dividend is paid every ſix months. The firſt dividend was of 9½ *per cent.* or 95 francs *per* ſhare; but 5 *per cent.* only were paid, and 4½ *per cent.* were reſerved for leſs favourable times, when the dividends might be under 5 *per cent.*

After many fruitleſs attempts by almoſt all the rulers of France from Charlemagne down to Louis XIV., France, during its ſhort-lived republican conſtitution, ſucceeded in eſtabliſhing uniform weights and meaſures upon the following ſimple plan. The French fundamental, elementary, or ſtandard meaſure, is connected with the dimenſions of the terreſtrial globe. This meaſure, which they call metre, or méſure par excellence, from the Greek μετροι, is the ten millionth part of a quarter of the terreſtrial meridian, that is to ſay, of the diſtance from the equator to the pole. It is equal to 3 feet 11 lines $\frac{44}{100}$.

The are ſerves to meaſure the ſurface of the ſoil in the ſame manner as the ancient arpent. It is equal to 100 ſquare metres, or 948 $\frac{31}{100}$ ſquare feet.

The ſtere is equal to a cubic metre, or $\frac{2027}{10000}$ cubic feet.

The litre is the meaſure of capacity. It is equal to a cubic decimetre, or 50 $\frac{45}{100}$ cubic inches, or one-twentieth of the former pint of Paris.

The gramme marks the weight. It is equal to the weight of a cubic centimetre of diſtilled water, and weighs 18 $\frac{841}{1000}$ grains.

Theſe five primitive meaſures are ſucceſſively multiplied or ſubdivided by ten, in order to form the greater or ſmaller meaſures by analogy to the decimal ſyſtem of arithmetic, which is almoſt univerſally adopted in Europe. The three diviſors are deci, centi, and milli, expreſſing the tenth, hundredth, or thouſandth part: thus, decimetre is the tenth part of the metre, deciare the tenth part of the are, deciſtere the tenth part of the ſtere, decilitre the tenth part of the litre, and decigramme the tenth part of the gramme. The four multiplicators are deca, hecto, kilio, and myria, denoting ten times, hundred times, thouſand times, and ten thouſand times, the primitive meaſure or weight; thus the decametre is ten metres, the hectare hundred ares, the kiliolitre a thouſand litres, the myriagramme ten thouſand grammes, or 20lb. 7 ounces, 58 grains.

That France has not yet recovered its former degree of proſperity may be inferred from the price of land, which is cheap, and the intereſt of money, which is very high. Mr. Pinkney, who travelled through the ſouth of France in

1807

1807 and 1808, reports, that an eftate of eleven hundred acres, feven hundred of which were in culture, the remainder wood and heath, was offered for fale for lefs than eight thoufand pounds fterling. The manfion-houfe was in ruin beyond the poffibility of repair; but the land, under proper cultivation, would have paid 25 *per cent.* on the purchafe money. There is no law prohibitory of ufury in the code Napoleon; the money market, like that of all other commodities, is left to find its own level.

But although the food, drefs, and accommodations of the inhabitants of France, have not been improved fince the revolution, their individual happinefs does not appear to have been materially impaired. Sunday is ftill a day of feftivity and a holiday. They fing and dance, and frequent the theatres. The arts of painting, ftatuary, architecture, mufic, and dancing, are held in high eftimation, and foftered with particular care. Seventeen of the principal towns of France have public galleries of pictures and ftatues, called mufeums, and the central mufeum at Paris contains above one thoufand paintings, each of which would be deemed a mafter-piece in the collection of a private individual. The moft eminent living painters of France are Vien, David, Regnault, Vincent, Greuze, Gérard, Girodet, Guerin, Hennequin, Ménageot, Taunay, &c. The moft eminent ftatuaries, Pajore, Moitte, Julien, Roland, Houdon, Dejoux, Foucou, Chaudet, Stouf, Boichot, &c. The beft French architects are David Ledoy, Cleriffeau, Gondouin, who built the Ecole de Chirurgie at Paris, Chalgrin, Le Grand, Molinos, Raymond, Percier, the younger Moreau, Le Doux, Brongniard, &c. The moft eminent mufical compofers in France are Grétry, Monfigny, Martiny, Daleyrac, Méhul, Goffec, Le Sueur, Langlé, Catel, Boyeldieu, Champein, Pleyel, Steibelt, Adam, Kalkbrenner, Kreutzer, Bruni, &c. The love of the arts is particularly encouraged by the fondnefs of the French for theatrical reprefentations, in which all the arts combine for the amufement of the fpectators. There is not a town of 30 or 40,000 inhabitants that has not a theatre, in which plays are performed almoft every evening from one end of the year to the other.

The principal amufement of which all the claffes of Frenchmen are equally fond is dancing. Excurfions to watering-places for pleafure only and change of fcene are confined to very few perfons of the very firft claffes of fociety. The moft renowned mineral waters of France are thofe of Bagnères and Barrège in the Upper Pyrenees, Uffat and Ax in the department of the Arriège, St. Amand in the department of the North, Bourbonne in the Upper Marne, Plombieres in the Vofges, Chaudes Aigues in the Cantal, Aix in the Bouches du Rhône, Sultz in the Lower Rhine, Sultzbach in the Upper Rhine, Spa in the department of the Ourte, and Aix la Chapelle in that of the Roër.

The French language is derived from the Latin. Its principal merit is the fteady regularity of its conftruction. Even French poetry admits few inverfions, and appears on that account extremely tame to the Englifh, Germans, and Italians, whofe poets, by the boldnefs of their inverfions, fpeak as it were a language of their own. It was only in the beginning of the 17th century that the French commenced to write with elegance. The merit of the literary works produced in French in the reign of Louis XIV. is generally acknowledged, and though the prefent be more particularly the age of fcience, France has yet fome eminent men in the department of the belles lettres, fuch as Delille, Le Brun, Bernardin de St. Pierre, Parny, Fontanes, Chénier, Colin d'Harleolle, Andrieux, Defaucherets, St. Lambert, Monvel, Picard, Anquétil, Ségur, Suard; and it is not very long fince fhe has loft her Voltaire, Rouffeau, Buffon, d'Alembert, La Harpe, Marmontel, Boufflers, Favre d'Eglantine, Roucher, Condorcet, &c. The average number of new books publifhed annually in France is from 1000 to 1200. But there is fcarcely a town of 15 or 20,000 inhabitants which has not a literary fociety, and the former royal academies at Paris have been replaced by a national inftitute. (See PARIS.) The public libraries of France are alfo numerous and important. The national library at Paris alone contained, in the beginning of 1807, 300,000 printed books, 70,000 manufcripts, 200,000 engravings, 40,000 copper medals, 30,000 gold medals, 30,000 filver medals, and many other curiofities.

France has a great many valuable remains of antiquity, which are detailed under the head of each department. There is in particular a moft interefting collection of monuments at Paris, called le Mufée des Antiques. See PARIS.

The confequences of the revolution were very fatal to religion and public education; but the former is regaining its falutary influence on the principles and actions of the French, and the latter has recently been provided for by the eftablifhment of an imperial univerfity at Paris, which is exclufively charged with the public inftruction, and controls every fchool and feminary of education in the empire. It is compofed of as many academies as there are tribunals or courts of appeal in France. There are fchools attached to each academy, in the following order: 1. Univerfities, called les facultés; 2. Lyceums; 3. Colleges, or grammar fchools; 4. Inftitutions, or feminaries; 5. Boarding-fchools, called penfionats; and, 6. The leffer, or primary fchools. The univerfities are compofed of five faculties, *viz.* theology, jurifprudence, phyfic, mathematical and phyfical fciences, and literature. The poet Fontanes, now comte de Fontanes, is grand mafter of the imperial French univerfity. There are alfo feveral eftablifhments for educating young men for fome particular public fervice, fuch as the Ecole Polytechnique, which admits three hundred boys, that are generally inftructed in mathematical and phyfical fciences, chemiftry, and drawing; and who, after a refidence of three years, are examined and paffed over, according to their particular inclination and talents, to the Ecoles des Ponts et Chauffées, d'Artillerie de Terre, d'Artillerie de la Marine, des Génie Militaire, des Mines, des Ingénieurs de Vaiffeau, &c. befides which there are two military colleges at Fontainbleau and Saint Cyr.

In the year 1754, the marquis de Mirabeau, father of the celebrated count of that name, rated the whole population of France at 18 millions.

In 1772 the abbé d'Expilly eftimated it at 22,140,357 individuals, and nearly at the fame epoch the celebrated Buffon ftated it at 21,672,777. In 1785 Mr. Neckar made it amount to 24,676,000.

In the year 1789 Mr. Bonvallet Defbroffes rated the population of France at 27,957,267, and in 1791 the committee of the National Affembly, from a more accurate calculation, ftated it to be 26,363,074.

In 1798 Mr. Prony made the population of France, including Corfica and the conquered countries, amount to 31,123,218, *viz.*

26,048,254 on the territories of ancient France.

3,511,055 in the Comtat Venaiffin, Savoye, Nice, Porentruy, Geneve, the Auftrian Netherlands, &c.

1,563,909 in the countries fituated between the Rhine and the Mofelle.

In 1799, Mr. Depere, in his Report to the Council of Five Hundred, ftated it at 33,501,694.

The

The ſenatus conſultum of the 4th of Auguſt 1802 made the whole population of France amount to	33,111,962
To which muſt be added for Piémont and the iſland of Elba, which were incorporated with France on the 26th of Auguſt and 11th of September 1802,	1,864,351
which makes the whole population in 1802	34,976,313

The chevalier de Tinſeau, in the ſecond edition of his ſtatiſtical view of France, publiſhed at London in 1805, deviates very little from this ſtatement. He rates the whole population of France at 33,104,343, and gives for the ſix Piemonteſe departments 1,946,800

Making in all	35,051,143. To theſe muſt be added,
For the three departments of the Apennines, Genoa, and Montenotte, formed out of the Ligurian republic -	928,563
For the department of the Taro, formed out of the duchies of Parma and Plaiſance -	368,084
For the departments of the Arno, Mediterranean, and Ombrone, formed out of Tuſcany or the kingdom of Etruria -	956,068
And for the departments of Rome and Traſimene, formed out of the papal dominions -	800,000, which makes the whole
population of the French empire	38,103,858

But taking the population of France as it was in the beginning of 1802, when its territorial extent was 30,505 ſquare leagues, it gives 1086 inhabitants for the ſquare league.

The moſt populous towns of the French empire are,

1.	Paris,	in	1803	had	672,000	inhabitants.
2.	Rome,	in	1807	—	134,973	——
3.	Marſeilles,	in	1807	—	96,413	——
4.	Bourdeaux,	in	1807	—	90,992	——
5.	Lyons,	in	1807	—	88,919	——
7.	Turin,	in	1807	—	79,000	——
9.	Genoa,	in	1807	—	75,000	——
6.	Rouen,	in	1807	—	87,000	——
8.	Nantes,	in	1807	—	77,162	——
10.	Bruſſels,	in	1807	—	66,297	——
11.	Antwerp,	in	1807	—	56,318	——

The annual number of births in France is as 1 to 25 ; and of theſe, every forty-ſeventh child in 1780 was illegitimate, whilſt the proportion now is that every eleventh child is illegitimate. The number of marriages is as 1 to 110 ; the number of deaths as 1 to 30. The prefect of the department of the Doubs, on comparing the accounts of the children that died under ten years of age in 1800, and of thoſe that died under ten years of age in 1802, found that 939 more children had died in that ſingle department in 1800 than in 1802, and aſcribed the difference to the great progreſs which the introduction of the vaccine had made in the latter period.

The conſtitution of the French empire may be defined a military deſpotiſm engrafted upon a republican form of government, Napoleon Bonaparte having exchanged the conſular for the imperial dignity. The privy council, or ſtate council, in which the emperor preſides, and of which all the princes of the imperial family, the princes, great dignitaries of the empire, and the miniſters of ſtate are members, is compoſed of thirty privy counſellors, or counſellors of ſtate, and thirty-five auditors. The ſenate, of which the French princes and the great dignitaries are alſo members, is compoſed of eighty ſenators named by the emperor. The legiſlative body is compoſed of two hundred and fifty deputies of the different departments of the French empire.

There are ten miniſters and one ſecretary of ſtate, *viz.* 1. A miniſter for the department of the adminiſtration of juſtice, called great judge, (grand judge). 2. A miniſter for the foreign department. 3. For the home department. 4. For the financial adminiſtration of the empire. 5. A chancellor of the exchequer. 6. A war miniſter. 7. For the adminiſtration of the war department. 8. For the adminiſtration of naval and colonial affairs. 9. For the general police of the empire ; and, 10. For the religious inſtitutions of the country. But theſe miniſters are accountable to the emperor only, and not to the nation.

The Roman Catholic religion has been declared that of the majority of the French people ; but the ſtate provides equally for the miniſters of the reformed church, either of the Lutheran or Calviniſtic confeſſion, and ſuperintends even the ſynagogues of the Jews. The difference of religion is no bar to the advancement of any French citizen to the higheſt offices in the ſtate.

There is an inferior court of juſtice in every diſtrict, and a juſtice of the peace in every canton. Every department has a criminal court of juſtice. There are thirty-five courts of appeal, and two ſupreme tribunals, called the Haute Cour Impériale, and the Cour de Caſſation. The Code Napoléon regulates both the civil and criminal proceſs. But all theſe inſtitutions are of ſo recent a creation, that there are no data yet to pronounce on their merits.

According to Mr. Neckar's report of the 1ſt of May 1789, the public revenue of France at that time amounted only to 475,294,027 livres Tournois annually, whilſt the annual expenditure was 531,444,000 livres Tournois. There was of courſe an annual deficit of 56,149,973 livres. The preſent regular revenue of France is derived from a land-tax, a perſonal tax, a tax on moveables and ſumptuaries, on houſes and windows, on patentees, on the privilege of exerciſing any profeſſion, additional centimes or hundredths ; from the produce of the national demeſnes and foreſts, cuſtoms, poſt office, lottery, ſalt mines, &c. all theſe taxes, in 1803, produced a ſum total of 569,500,000 francs, which,

together with contributions levied in foreign countries, called recette extérieure, and amounting to, - -	20,000,000	
covered the expenditure of the ſame year, amounting to	589,500,000	francs.

The principal heads of this expenditure were

1. Intereſt

1.	Intereſt of the national debt	64,023,482 francs.
2.	Adminiſtration of juſtice	23,318,730
3.	Foreign department	7,000,000
4.	Home department	47,110,000
5.	Collection of the revenue and penſions	56,047,788
6.	Public exchequer	6,000,000
7.	War department	243,000,000
8.	Naval department	126,000,000
9.	Sundries, and ſurplus in reſerve	17,000,000
		589,500,000

The national debt of France, which in 1789 exceeded three milliards, or three thouſand millions of francs, is reduced to leſs than one third, and as there are ſeveral annuities dropping off every year, it ſcarcely requires 60 millions annually for both the intereſt and the annuities. In the budget for the year following the above ſtatement of expenditure, both the intereſt of the conſolidated debt and the annuities are ſtated together at 58,730,000 francs. There is alſo a ſinking fund.

Beſides paying the general taxes and impoſts of the country, every department is obliged to provide for its adminiſtrative, judiciary, and ſchool expences.

The police of France, which even before the revolution was conſidered as excellent, is more vigilant than ever. It employs an incredible number of ſpies, and is powerfully aſſiſted by the national gendarmerie, a corps of 17,445 horſemen, divided into 28 legions, ſtationed by ſmall brigades all over the country, and deſtined to watch more particularly over the ſafety of the high roads.

There is no legal proviſion for the poor in France, but they are maintained in richly endowed charitable foundations, or ſupported by the liberality of a generous public. The hoſpital of the blind at Paris admits 420 blind individuals. The inſtitution for the deaf and dumb, which is become ſo celebrated by the talents of the late abbé de l'Epée, and its preſent director the abbé Sicard, admits only 60 pupils. There is a board of health at Charenton, a general hoſpital for gratuitous vaccination, and ſcarcely any town of importance is without infirmaries and charitable foundations. Begging is ſtrictly prohibited. Every beggar is taken to a dépôt de mendicité.

The army of France, that powerful engine with which ſuch aſtoniſhing deeds have been performed, and ſuch important changes operated on the continent of Europe, conſiſts of

90 Infantry regiments of the line, each at 3230 men each	290,700
27 Regiments of light infantry, at 3230 men each	87,210
2 Regiments of carabiniers, at 706 men	1,412
12 Regiments of cuiraſſiers, at 706 men	8,472
30 Regiments of dragoons, at 946 men	28,380
24 Regiments of chaſſeurs, at 946 men	22,704
10 Regiments of huſſards, at 946 men	9,460
8 Regiments of artillery on foot, at 2582 men each	20,656
6 Regiments of hotillerie à cheval, at 524 men each	3,144
22 Battalions of the artillery train, at 477 men each	10,494
16 Companies of artillery labourers, at 78 each	1,248
2 Battalions of pontoneers, at 610 men	1,220
9 Companies of miners, at 100 men	900
5 Battalions of ſapeurs, at 909 men	4,545
1 Battalion of gardes du génie	550
Men	491,095

commanded by fifteen marſhals of the empire, 150 generals of diviſions, 300 generals of brigades, and 135 adjutants commandants. This army is recruited by voluntary enliſtings and by a rigorous conſcription, which comprizes all Frenchmen from the age of 20 to that of 25, without any diſtinction of rank, fortune, or buſineſs; but every ſoldier is entitled to be gradually promoted to the higheſt military appointments, provided he be found fit for the ſame. No military commiſſions whatever can be ſold. The military ſpirit of the French ſoldier is ſupported and animated by the decoration of a military order, which may be obtained alſo in a few caſes for civil merits, called the legion of honour, compoſed of 16 cohorts, poſſeſſed each of national demeſnes to the amount of an annual income of 200,000 francs. Each cohort conſiſts of ſeven great or ſuperior officers or dignitaries, 20 commanders, 30 officers, and 350 légionnaries. The great officers have an annual income of 5000 francs, the commanders 2000, the officers 1000, and the légionnaries 250. The knights of the legion of honour amount in all to 6512.

In the reign of Louis XIV. the French navy was ſtrong enough to equip a fleet of 63 ſhips of the line, 7 frigates, 36 veſſels armed en flute, and 14 cutters, under the orders of admiral de Tourville in the year 1690, and in 1704 the French fleet that fought the combined Engliſh and Dutch fleets at Veles Malaga conſiſted of 50 ſhips of the line, 8 frigates, and 9 fire ſhips. On the 1ſt of March 1791, the French had 73 ſhips of the line, 67 frigates, 19 cutters, 29 armed brigs, 7 gun boats, beſides ſeveral hoſpital ſhips, galliots, and others. But at preſent the French navy is reduced to a very low ſtate, and it is not probable that the intention of the French government to have at leaſt 100 ſhips of the line and 100 frigates afloat, will ſoon be realized. In the mean time the French have ſtill 7 vice-admirals, 16 rear-admirals, and about 200 poſt captains, on their navy liſt.

France holds at this moment the firſt rank among all the powers of the continent of Europe, and keeps them either in vaſſalage, or is in relations of amity with them all, except a ſmall portion of Spain, Great Britain, Portugal, and the iſland of Sicily.

The national character of the French has not been materially altered by their late political revolution. They are ſtill lively, polite, witty, amiable and brave; but vain glorious, inconſtant, volatile, and eaſily diſcouraged. They have been taxed of inſincerity in their offers of ſervices; but their wiſh to oblige ſtrangers whom they conſider as viſitors is really unfeigned. Mr. Pinckney, one of the lateſt travellers in France, obſerves that the French are unwearied in their acts of kindneſs. They offer their minor ſervices with ſincerity. They can never be ſufficiently praiſed for their indiſcriminate, their natural, their totally unintereſted and ſpontaneous benevolence.

France, *Iſle of*, a part of France, ſo called before the revolution, being bounded by the rivers Seine, Marne, Oiſe, Aiſne, and Ourque. Paris, ſituated in the centre, was its capital.

France, *Iſle of*. See Mauritius.

France, *School of Engravers in*. See French *ſchool of Engravers*.

FRANCESCA, Pietro Della, commonly called *Franceſco Dal Borgo a San Sepolcro*, in *Biography*, was a painter of conſiderable merit and renown, for the early period of the art in which he lived.

He was born at Borgo in Umbria in 1372. In his youth he ſtudied the mathematics, and it was not till he was 15 years of age that he determined on being a painter, when he was patronized, or (as Vaſari terms it) adopted by Gindobaldo

baldo Fettro, duke of Urbino. He did not, however, so completely devote his time to painting, as to neglect his former studies, but wrote several essays on geometry and perspective, which were long preserved in the duke's library at Urbino. He afterwards painted in Pesara, Ancona, and Ferrara; but few of his works remain at either of these places.

Having obtained much reputation, he was sent for to Rome by pope Nicholas V. to paint two historical subjects in the chambers of the Vatican, in concurrence with Bramante di Milano, called Bramantino; but such was the greater esteem in which the talents of Raphael were justly held when he some years after flourished, that Julius II. destroyed these two pictures to make room for his favourite artist to paint in their stead the miracle of Bolsena, and St. Peter in prison.

Notwithstanding this degradation of his labours, before the superior powers of Raphael, he was very deserving of esteem, if the account which Vasari gives of him be true, and we consider the imperfect state of the art at the time in which he lived. He exhibited much knowledge of anatomy, feeling of expression, and of distribution of light and shade. The principal work of Francesca was a night scene, in which he represented an angel carrying a cross, and appearing in vision to the emperor Constantine sleeping in his tent with his chamberlain near him, and some of his soldiers. The light which issued from the cross and the angel illuminated the scene, and was spread over it with the utmost discretion. Every thing appeared to have been studied from nature, and was executed with great propriety and truth. He also painted a battle which was highly commended for the spirit and fire with which it was conducted; the strength of the expression, and the imitation of nature; particularly a group of horsemen, which Vasari says, "considering the period, cannot be too highly commended."

Having exercised the various talents nature had bestowed upon him, till he was 86 years old, he shared the common fate of mankind, and died in the year 1458.

FRANCESCAS, in *Geography*, a town of France, in the department of the Lot and Garonne, and chief place of a canton in the district of Nérac; six miles S.E. of Nérac. N. lat. 44° 3'. E. long. 0° 30'. The place contains 1314, and the canton 7624 inhabitants, on a territory of 145 kiliometres, in 21 communes.

FRANCESCHELLO, in *Biography*, the most exquisite performer on the violoncello of his time, flourished early in the last century. The admirable Benda, first violin to the king of Prussia, (Frederic,) and so justly celebrated for expression on his instrument, in his life, written by himself, speaks of the great advantage he received from frequently hearing and playing with Franceschello. Geminiani used to relate of him, that in accompanying Nicolini, at Rome, in a cantata composed by Alessandro Scarlatti, for the violoncello, the author, who was at the harpsichord, would not believe that a mortal could play so divinely; but said, that it was an angel who had assumed the figure of Franceschello; so far did his performance surpass all that Scarlatti had conceived in composing the cantata, or imagined possible for man to express.

FRANCESCHINI, Marc Antonio, an historical painter, born at Bologna in 1648. He was at first a disciple of G. Battista Galli, and from him entered the school of Carlo Cignani.

That master, who soon discovered the talents of his pupil, not only formed his style, but made him his relation by marrying him to his niece, and he soon became his principal assistant. He was employed in embellishing many churches and convents in his native city, and in other parts of Italy; and particularly at Modena; he painted the grand hall of the duke's palace so much to the satisfaction of that prince, that he wished to retain him at his court by an offer of a large pension, and such honours as were due to his merit. But Franceschini preferred his freedom and ease to the greatest acquisitions of wealth, and with polite respect refused the offer. At Genoa he painted, in the great council chamber, a design, that at once manifested the fertility of his invention, and the grandeur of his ideas; for most of the memorable actions of the republic were there represented with a multitude of figures nobly designed, judiciously grouped and disposed, and correctly drawn. And in the Palazzo Monti at Bologna is a small gallery painted by him, of which the colouring is exceedingly lovely, though the figures appear to want roundness.

Franceschini, though of the school of Cignani, is original in the suavity of his colour, and the facility of his execution. He is fresh without being cold, and full without being crowded. As he was a machinist, and in Upper Italy what Cortona was in the Lower, symptoms of the Mannerist appear in his works. He had the habit of painting his cartoons in chiaro-scuro, and, by fixing them to the spot where the fresco was to be executed, a judge of their effect.

He preserved the powers of his mind and pencil unaltered at a very advanced age, and when he was even 78 years old, he designed and coloured his pictures with all that fire and spirit for which he had been distinguished in his best time. He died in 1729, at the age of 81. Fuseli's Pilkington.

Franceschini, Baldassare, called *Volterrano*, a painter of history, landscape, and portrait, born at Volterra in 1621. He studied under Matteo Sorella and Roselli, but principally formed himself by his study of Corregio. He painted a great variety of works with considerable success, but excelled principally in portrait. He died in 1689, aged 68.

FRANCESES, in *Geography*, a small island near the coast of Brazil. S. lat. 20° 12'.

FRANCESINA, Signora, in *Biography*, a very pleasing female Italian singer, and a beautiful woman, arrived in England in 1736, in order to sing in the opera established by the nobility and gentry against Handel; and the Daily Post, Nov. 18, of that year, informs us that "Sig^r. Mirighi, Sig^r. Clementi, and the Francesina, (three singers lately come from Italy for the Royal Academy of Music,) had the honour to sing before her majesty, the duke, and princesses, at Kensington, on Monday night last, and met with a most gracious reception; and her majesty was pleased to approve their several performances: after which the Francesina performed several dances to the entire satisfaction of the court." We believe she never danced on the stage in England, though she remained here as a singer to the end of her life. She however sung for Handel at the end of his opera regency in Lincoln's-inn-fields, 1740, in the little drama of "Imeneo," or Hymen, and in 1741 in "Deidamia," the last opera which he composed, and in which she had an air at the end of the first act, "Nascondi l'usignol," composed in a light airy style, suited to the active throat of the Francesina. It was for the natural warble of this singer that Handel composed his English airs of execution, such as "Sweet Bird," in Milton's Penserosa, "Myself I shall adore," and "The morning lark to mine attunes his throat," in Congreve's Semele, &c. Though the Francesina came hither as second woman, and had not a voice sufficiently powerful for a first woman's part in a large theatre, having quitted the opera stage, she attached herself to Handel, and was the principal singer in his oratorios during many years.

FRANCESIO, Araia, maeftro di cappella to the court of Ruffia, was born at Naples. His firft effay in compofition, after quitting the confervatorio, was the opera of "Berenice," performed at the court of the grand duke of Tufcany at Florence in 1730. This was followed, in 1731, by "Amore per regnante" for Rome. In 1735 he was called to Peterfburgh by the emprefs Anne, with a complete band of vocal and inftrumental performers; where he compofed the firft Italian opera that was ever heard in that capital. During this reign concerts were eftablifhed at the imperial palace twice a week. In 1737 he fet the opera of "Abiazure," and in 1738 "Semiramide," for the imperial theatre.

The emprefs Elizabeth, who began her reign in 1741, and had a paffion for mufic, continued Araia in the office of maeftro di cappella to the court. At her coronation, "La Clemenza di Tito" of Metaftafio, fet by Haffe, was performed, but with a prologue fet by Araia, entitled "La Ruffia affiitta e confolata." Soon after this event Peterfburgh firft heard an opera, "Cephalis and Procris," in the Slavonian language, which was likewife fet in the Italian ftyle by Araia, whofe tafte was refined and melody graceful. He was honoured with the title of Aulic counfellor, and received magnificent prefents from the court before he quitted Ruffia, and in 1759 he returned to Italy poffeffed of confiderable wealth, and fettled at Bologna, where he enjoyed the fruits of his labours and good fortune in fplendid eafe and tranquillity.

FRANCESTOWN, in *Geography*, an interior pofttown of America, in Hillfborough county, New Hampfhire, on the E. fide of Contacook river, about 21 miles to the S.W. of Concord. It was incorporated in 1772, and in 1800 contained 1355 inhabitants.

FRANCFORT *on the Mayne*, a large, wealthy, imperial city of Germany, in the circle of the Upper Rhine, fituated in a healthy, fertile, and beautiful country on the river Mayne, which divides it into two parts, diftinguifhed by the names of Francfort and Saxenhaufen; 20 miles N.E. of Mentz, and 350 W. by N. of Vienna. The whole city is divided into 14 wards, of which two are fituated in Saxenhaufen. Its circumference is about a league and a half; its fortifications, confifting of a wall lined with towers, and ditches filled with water, ramparts, baftions, &c. are regular and folid; but they ferve chiefly for appearance, as the place is on all fides eafily acceffible. Its garrifon commonly confifts of 13 companies of foldiers. The ftreets are fpacious, regularly paved, and well lighted. The houfes exhibit a fplendid appearance, the fhops are well ftocked, and the inhabitants live in a coftly ftyle. No city in Europe contains larger and more magnificent buildings, elegant private houfes and commodious inns, all built of large and fquare ftones. The town-houfe, called "Römer," is a large magnificent building; and among its archives is feen a cafket of gold, containing the golden bull of the emperor Charles IV. in which are infcribed, in Latin capital letters, the fundamental ftatutes of the empire. In one of the churches belonging to the Roman catholics is a curious clock, confifting of three parts. In the loweft, which has the appearance of a calendar, are feveral circles, the firft of which fhews the days and months; the fecond the golden number, with the age and change of the moon; and the third the dominical letter. The fourth and fifth circles reprefent the ancient Roman calendar. On the fixth are the names of the apoftles and martyrs, the length of the days and nights, and the entrance of the fun into the 12 figns of the zodiac. The feventh and eighth circles exhibit the hours and minutes of the fun's rifing and fetting. In the ninth circle, the divifions of the 12 figns of the zodiac, the four feafons, the 12 months, &c. are marked. The circle in the centre fhews the moveable feafts. The figures which ftrike the hours reprefent two fmiths with hammers in their hands. This curious piece of workmanfhip was put up in 1605, and repaired for the firft time in 1704. In 1780 its inhabitants, including Jews and Catholics, were reckoned to be about 40,000. The Roman catholics have three churches, and the Lutherans fix: the Calvinifts were formerly obliged to celebrate their worfhip at Bornheim, a village about fix Englifh miles from the city, belonging to the landgrave of Heffe Caffel. In the year 1790 they obtained permiffion to erect public places of worfhip, and were allowed the free exercife of their religion. Their number is very confiderable, and they are confidered as the moft induftrious and wealthy of the inhabitants. The greateft part of the Calvinift families confifts of the defcendants of French proteftants, who left their country at the revocation of the edict of Nantz; they have two churches, to one of which belongs a German, and to the other a French preacher. There are feveral convents of female nobility, belonging to proteftant families, the ladies of which are allowed to marry and to affociate with the moft noble families in the city. There are alfo feveral Roman catholic male and female convents, the members of which do not keep public affemblies, and are enjoined celibacy by vow, conformably to the Roman catholic church. Here is alfo a feminary, named the "Englifh Proteftant Convent," eftablifhed for families of Englifh extraction, whofe predeceffors fled to Hamburgh and to Holland during the perfecutions in the reign of queen Mary; the latter of whom, having been driven from Holland by the cruelty of the duke of Alva, found an afylum for themfelves and their pofterity in this city. The Jews of Francfort are reckoned to be about 8000; they are reftricted by law to a narrow ftreet, and prohibited from living in any other part of the city. They have a public fynagogue of confiderable fize. Francfort has not any univerfity; but it has many eftablifhed colleges, belonging to the learned of all fciences, to which foreigners have free accefs. Doctors of law, and all belonging to jurifprudence, medicine, furgery, natural hiftory, natural philofophy, mechanics, &c. meet regularly twice a week. Public lectures on thefe fciences are delivered, and mechanical inventions are exhibited. Since the year 1789 an agricultural fociety has been eftablifhed in this city. Society at Francfort is divided into the ancient and modern nobility, and "burgeois." The firft confifts of fome ancient noble families from various parts of Germany, who refide here for feveral months in the year. Modern nobility comprehends thofe who have obtained the rank of nobles, and are generally called "patricians," they refide here continually; and fo do the "burgeois," fuch as bankers and great merchants who have made their fortunes by commerce, and who are very numerous.

Francfort is advantageoufly fituated for trade; the articles which it exports confift of wine, corn, hemp, timber, flax, iron, madder, feed of all forts, linen, lace, hides, leather, mineral waters, inland tobacco, hams, four krout, and many other raw materials, and minerals. Its trade is much aided by its two annual fairs, to which there is a great refort of perfons from all parts of Europe. One fair begins on Eafter Tuefday, the other in the middle of the month of September; and each continues three weeks. Six months before each fair begins, Francfort is fupplied from all parts of the world with foreign ftores, manufactures, &c. either by water or by land; and it may then be called a depôt of foreign productions. At the time of the fair, the wealthieft merchants in the German empire refort to this city, and by their purchafe and fales fupply almoft all other places on the continent of Europe. The third week of the fair is called the pay-week; and thofe who then neglect their payments

are declared bankrupts, and obliged to fly the country till their affairs are fettled, or if taken, are put under arreft. The magiftrates of Francfort are divided into three benches; the firft is compofed of 14 echevins, the fecond of 14 counfellors, and the third chiefly of tradefmen or artificers. All affairs of importance are decided by the two former, out of whom two burgomafters are annually chofen; the third bench executes offices relating to the police. Francfort was affeffed 500 florins for the Roman month, and is taxed to the imperial chamber 676 rixdollars, 26 kreutzers. The government of this city is generally allowed to be one of the beft and moft moderate in Germany. During the reign of the emperor Jofeph II. many falutary laws were eftablifhed in this and other imperial cities. The old cuftom of indulging extravagantly in the expence of funeral pomp and coftly mourning, by which many families were ruined, has been altogether abolifhed in Francfort. Another law was enacted, which prohibits the burying of dead bodies in any church or chapel whatever. All forts of beggars are alfo prohibited by law, and the wanderings of gypfies are alfo forbidden.

The origin of this ancient city has not been fatisfactorily afcertained. Some have afcribed it to Marcomire, duke of Franconia, father to Pharamond: others to one of his predeceffors, named Francus, who lived 100 years before him, and they fay it was anciently called "Trajectum Francorum." It was alfo denominated "Helenopolis," from Helen, mother of Conftantine the Great. In 1792 this city was taken by the French, but foon after refigned to the Pruffians. In 1796 it was furrendered to the French, and taxed to pay fix millions of livres in fpecie, and two millions in provifions. On the defeat of Jourdan at Wurzburg, the French were obliged to evacuate it in the fame year.

A council was held here in 794, againft the herefy of Felix, bifhop of Urgel, who taught that Chrift was the fon of God only by adoption; and another in 1006 to erect the city of Bamberg into a bifhopric. N. lat. 50° 7′ 40″. E. long. 8° 35′ 45″.

FRANCFORT *on the Oder*, a town of Germany, in the Middle Mark of Brandenburgh, containing about 16,000 inhabitants, with an univerfity, founded, as fome fay, in the year 1516, by the elector Joachim, or according to others by John Cicero, the father of this elector. The profeffors are of the Calviniftic perfuafion. Befides the univerfity it has a noble academy, a fociety for promoting the arts and fciences, two colleges, two fauxbourgs, and feveral churches. In the year 1806 this town fell into the hands of the French: 12 miles S.S.W. of Cuftrin, and 48 E. of Berlin. N. lat. 52° 22′ 8″. E. long. 14° 45′.

FRANCHE-COMTE, anciently called Upper Burgundy, was, before the revolution, a province of France, bounded on the north by Lorraine, on the E. by Switzerland and Savoy, on the S. and W. by Burgundy and Champagne; lying between 46° 15′ and 47° 55′ N. lat., and between 5° 20′ and 6° 55′ E. long., being 39 leagues from N. to S. and 20 to 26 in breadth, and containing upwards of 700,000 inhabitants. Its form is oval, half of it is level, and the other half uneven and hilly. The foil confifts of red ferruginous loam, fchiftus, gravel, and lime-ftone, and yields grain, wine, fruits, and excellent paftures. It has mines of iron, copper, and lead. The moft confiderable rivers are the Saone, the Doubs, and the Oiguon. When this province was feparated from Burgundy it received its modern appellation; and by the treaty of Nimeguen, A.D. 1678, was annexed to France. It was divided into four large diftricts, *viz.* Befançon, Dole, Amont, and Aval, which now compofe three departments, *viz.* Saone, Doubs, and Jura.

FRANCHIMONT, a town of France, in the department of the Ourthe, with a fmall country to which the title of marquis was annexed; 13 miles S.E. of Liege.

FRANCHINUS, GAFFURIUS, in *Biography*, the firft and the beft writer on counterpoint in Italy, before the time of Zarlino. In the preface to an early edition of one of his works, the editor, Pantaleone Melegulo of Lodi, has given an account of his life and writings, whence we have extracted the following particulars. Franchinus Gaforius, or Gaforio, of Lodi, (Walther miftakenly makes him a native of Lyons, in France, Lundenfis,) born 1451, was the fon of Betino, a foldier in the fervice of Gonzago, duke of Mantua, and Catherine Fixaraga, of the fame place. He was firft intended for prieft's orders, but after ftudying mufic for two years under friar John Goodenach, a carmelite, he manifefted fo much genius for that fcience, that it was thought expedient to make it his profeffion. After learning the rudiments of mufic at Lodi he went to Mantua, where he was patronized by the marquis Lodovico Gonzago; and where during two years he purfued his ftudies with unwearied affiduity night and day, and acquired great reputation both in the fpeculative and practical part of his profeffion. From this city he went to Verona, where he read public lectures on mufic for two years more, and publifhed feveral works; after which he removed to Genoa, whither he was invited by the doge Profpero: there he entered into prieft's orders. From Genoa he was invited to Milan by the duke and duchefs Galeazzo, but they being foon after expelled that city, he returned to Naples, where Philip of Bologna, profeffor royal, received him as his colleague; and he became fo eminent in the theory of mufic, that he was thought fuperior to John Tinctor, William Guarnieri, Bernard Yeart, and many celebrated and learned muficians, with whom he now converfed and difputed. He there compofed and publifhed his profound "Treatife on the Theory of Harmony," 1480; which was afterwards corrected, enlarged, and republifhed at Milan, 1492; but the plague raging in Naples, and that kingdom being likewife much incommoded by a war with the Turks, he retreated to Otranto, in Apulia; whence, after a fhort refidence, he returned to Lodi, where he was protected and favoured by Pallavicino the bifhop, and opened a public fchool, in which, during three years, he formed many excellent fcholars. He was offered great encouragement at Bergamo if he would fettle there; but the war being over, and the duke of Milan, his old patron, reftored, he preferred the refidence of that city to any other. It was here that he compofed and polifhed moft of his works; that he was careffed by the firft perfons of his time for rank and learning; and that he read lectures by public authority to crowded audiences, for which he had a faculty granted him by the archbifhop and chief magiftrates of the city in 1483, which exalted him far above all his cotemporary brethren: and how much he improved the fcience by his inftructions, his lectures, and his writings, was teftified by the approbation of the whole city; to which may be added the many difciples he formed, and the almoft infinite number of volumes he wrote, among which feveral will live as long as mufic and the Latin tongue are underftood. He likewife firft collected, revifed, commented, and tranflated into Latin the ancient Greek writers on mufic, Bacchius fenior, Ariftides, Quintilianus, Ptolemy's Harmonics, and Manuel Briennius. The order of the works which he publifhed is as follows: "Theoricum Opus Harmonicæ Difciplinæ," mentioned above, Neapolis, 1480, Milan, 1492. This was the firft book on the fubject of mufic that iffued from the prefs after the invention of printing, if we except the "Definitiones Term. Muficæ," of John Tinctor. "Practica

Muficæ utriufque Cantus," Milan, 1496, Brefcia, 1497, 1502; and Venice, 1512. "Angelicum ac Divinum Opus Muficæ Materna Lingua Scrip." Milan, 1508. "De Harmonica Muficor. Inftrumentorum," Milan, 1518. This work, we are told by Pantaleone Melegulo, his countryman and biographer, was written when Gafforio was forty years of age, that is to fay, in the year 1501; and though the fubject is dark and difficult, it was abfolutely neceffary for underftanding the ancient authors. If, fays Pantaleone, a life fpent in labour for the advancement of fcience, and in a feries of laudable actions, can entitle a human being to fame in this world, and felicity in the next, the claim of Gafforio to both feems indifputable.

The doctrines of this venerable and excellent theorift, who died in 1520, are fo frequently cited in the courfe of this work, that after the ample lift juft given, a table of contents, or extracts from them here, feem alike unneceffary. We were difappointed at not finding the name of Franchinus or Gaffurius, for he is called by both thefe titles in mufical books, either in Ducange or Fabricius. An authority fo good and fo ancient of the ufe of mufical terms in the Latin language would have been more fatisfactory to the readers of Ducange, than that of many obfcure monks which he is obliged to cite: and Fabricius, who fo frequently fpeaks of mufical tracts and of their authors, might have furnifhed his work and his readers with a ufeful and interefting article, in giving an account of Gaffurius and his writings, which, being chiefly compofed in Latin, had a claim to his notice.

FRANCHISE, a fpecies of incorporeal hereditament, having the privilege or exemption from ordinary jurifdiction. And the term is alfo ufed for an immunity from the ordinary tributes and taxes.

This is either real or perfonal; that is, either belonging immediately to the perfon, or accruing on account of this or that place, or office of *immunity*, which fee.

Thefe franchifes, being royal privileges, or branches of the king's prerogative, fubfifting in the hands of a fubject, are derived from the crown by grant or charter, and in fome cafes are held by prefcription and ufage. They may be vefted either in natural perfons, or bodies politic; in one man or in many; but the fame identical franchife that has before been granted to one, cannot be beftowed on another, for that would prejudice the former grant. The principal kinds of franchifes are the following: to be a county palatine is a franchife vefted in a number of perfons. It is likewife a franchife for a number of perfons to be incorporated, and fubfift as a body politic, with a power to maintain perpetual fucceffion, and do other corporate acts; and each individual member of fuch corporation is alfo faid to have a franchife or freedom. Other franchifes are to hold a court leet; to have a manor or lordfhip; or at leaft, to have a lordfhip paramount; to have waifs, wrecks, eftrays, treafure-trove, royal fifh, forfeitures, and deodands; to have a court of one's own, or liberty of holding pleas and trying caufes; to have the cognizance of pleas, which is a ftill greater liberty, being an exclufive right, fo that no other court fhall try caufes arifing within that jurifdiction; to have a bailiwick, or liberty exempt from the fheriff of the county, wherein the grantee only and his officers are to execute all procefs; to have a fair or market, with the right of taking toll, either there or at any other public places, as bridges, wharfs, and the like; which tolls muft have a reafonable caufe of commencement, elfe the franchife is illegal and void; or, laftly, to have a foreft, chafe, park, warren, or fifhery, endowed with the privileges of royalty. See the feveral articles above recited.

FRANCHISE, *Allowance of.* See QUO *Warranto.*

FRANCHISE, *Difturbance of.* See DISTURBANCE.

FRANCHISE is alfo ufed for an afylum, or fanctuary, where people are fecure of their perfons, &c.

Churches and monafteries in Spain are franchifes for criminals; fo were they anciently in England, till they were abufed to fuch a degree that there was a neceffity for abolifhing the cuftom.

One of the moft remarkable capitulars made by Charlemagne in his palace of Heriftal, in 779, was that relating to the franchifes of churches. The right of franchife was held fo facred, that even the lefs religious kings obferved it to a degree of fcrupuloufnefs; but to fuch excefs in time was it carried, that Charlemagne refolved to reduce it. Accordingly he forbade any provifion being carried to criminals retired into churches for refuge.

FRANCHISE *of Quarters*, is a certain fpace, or diftrict, at Rome, wherein are the houfes of the ambaffadors of the princes of Europe; and where fuch as retire cannot be arrefted or feized by the fkirri, or fergeants, nor profecuted at law.

The people of Rome look on this as an old ufurpation, and a fcandalous privilege, which ambaffadors, out of a jealoufy of their power, carried to a great length in the fifteenth century, by enlarging infenfibly the dependencies of their palaces and houfes, within which the right of franchife was anciently confined. Several of the popes, Julius III. Pius XIV. Gregory XIII. and Sixtus V. publifhed bulls and ordinances againft this abufe; which had refcued fo confiderable a part of the city from their authority, and rendered it a retreat for the moft abandoned perfons.

At length Innocent XI. exprefsly refufed to receive any more ambaffadors, but fuch as would make a formal renunciation of the franchife of quarters.

FRANCHISE, *Royal*, is a place where the king's writ runs not; as at Chefter and Durham; and anciently at Tyndal, and Hexamfhire in Northumberland. But Bracton fays, that a franchife royal is where the king grants to one and his heirs an exemption of toll, &c.

FRANCHISING. See ENFRANCHISEMENT, and MANUMISSION.

FRANCIA, FRANCESCO, in *Biography*, an hiftorical painter, who is known by that name, but whofe real one was Raibolini. He was born at Bologna in 1450, and was bred to the profeffion of a goldfmith, which he exercifed for fome time with very confiderable celebrity, having the coinage of the city of Bologna under his care.

His defire of reputation, and his acquaintance with Andrea Mantegna and other painters, led him to the ftudy of painting, and in 1490 he produced a picture of the virgin feated, and furrounded by feveral figures; among whom is the portrait of M. Bart. Felifini, for whom the picture was painted. This, and another picture of a fimilar fubject, painted for the chapel Bentivoglio a St. Jacopo, gained him great repute. He painted many pictures for churches, &c. in Bologna, Modena, Parma, and other cities; but they were in the early, Gothic, dry manner, which he greatly improved upon in his latter productions. On Pietro Perugino he formed his characters of heads, and his choice of tone and colour; on Gian. Bellino fullnefs of outline and breadth of drapery; and if the beft evidence of his merit, the authority of Raphael, be of weight, in procefs of time he excelled them both. In a letter dated 1508, edited by Malvafia, Raphael declares, that the Madonnas of Francia were inferior in his opinion to none for beauty, devoutnefs, and form. His idea of Francia's talents exhibited itfelf ftill ftronger in his entrufting his picture of St. Cecilia, deftined for the church of St. Gio da Monte

Monte at Bologna, to his care, by letter soliciting him as a friend to see it put in its place, and if he found any defect in it that he would kindly correct it.

Vasari says that Francia died with grief upon seeing by this picture that he was as nothing in the art compared with the superior genius of Raphael. Malvasia confutes Vasari, and proves that he lived some years afterwards, and in an improved style produced his celebrated St. Sebastian, which Caracci describes as the general model of proportion and form for the students at Bologna.

Francia, in *Geography*, a town of Naples, in Calabria Ultra; 8 miles N.E. of Nicotera.

FRANCIABIGIO, Marco Antonio, or *Francia Bigio*, in *Biography*, as Vasari calls him, was an historical painter, born in 1483. He studied for a short time under Albertinelli, but is chiefly known as the competitor, and in some works the partner of Andrea del Sarto. Similar in principle, but inferior to him in power, he strove to supply by diligence the defects of nature; with what success, will appear on comparison of his work in the cloister of the Nunziata at Florence, with those of Andrea at the same place. On its being uncovered by the monks, the painter in a fit of shame or rage gave it some blows with a hammer, nor ever after could be induced to finish it. He appears to have succeeded better in two histories which he inserted among the frescos of Andrea at the Scalzo, nor is he there much inferior. He likewise emulated him at Poggio a Cajano, where he represented the return of M. Tullius from exile, a work, which though it remained unfinished, shews him to great advantage. Fuseli's Pilkington.

FRANCIGENA, or Frenchman, in our *Ancient Customs*, was a general appellation of all foreigners; *i. e.* all persons who could not prove themselves Englishmen.

FRANCIS I., in *Biography*, emperor of Germany, son of Leopold, duke of Lorrain, was born in the year 1708. In early life he served with high reputation in the wars of Hungary and Bohemia. He married Maria Theresa, daughter and heiress of the emperor Charles VI., and having by the death of his father become duke of Lorrain, he ceded it to France, and obtained in its stead the duchy of Tuscany as an indemnification. After the decease of his father-in-law, Maria Theresa associated her husband in the administration of her estates, and in 1745 he was elected to the empire. He obtained and merited the character of a humane prince, but was not great as an emperor. He was anxious to promote the good of his subjects, and was a patron of the arts and sciences. He died at Inspruck in 1765, leaving behind him a numerous family. Univer. Hist.

Francis I., king of France, son of Charles Orleans, and Louisa of Savoy, was presumptive heir to the crown in the reign of Lewis XII. who married him to his eldest daughter. At the death of Lewis he succeeded to the throne, being then in his twentieth year. Formed with the mien of a hero, he excelled in the exercises of a martial age; eloquent in debate, and undaunted in action, courteous in his manners, and bounteous in his disposition, his virtues and accomplishments dazzled the unthinking crowd, who were blind to the miseries which awaited his impetuous valour and inconsiderate ambition. He was impatient to distinguish himself, and resolved to assert the claims of his house upon the duchy of Milan, and, passing the Alps with a powerful army, entered that country. To supply the funds for this expedition, Francis, by the advice of his chancellor, not only restored the taxes which his predecessor had abolished, but exposed the offices of the crown to sale, and endeavoured to replenish his coffers by measures the most arbitrary and impolitic. A confederacy was formed against him by the emperor Maximilian, Ferdinand of Arragon, Leo X., Sforza, and the Swiss: the number and resources of his enemies seemed only to stimulate his ardour; the passes of the Alps which had been occupied by the Swiss were eluded; new roads were cut by the active perseverance of the French; the army, after having surmounted every obstacle of nature and art, entered Italy, and surprised the general of the papal forces, who, ignorant of their approach, was negligently encamped with a thousand cavalry on the banks of the Po. Francis, on receiving the intelligence of this success, prepared to join his commander, and during his absence devolved the regency of France on his mother Louisa of Savoy, a princess, whose character in a great measure influenced the various events which diversified the reign of her son. The king of France, on assuming the command of the army, entered the Milanese, and pressed on towards the capital. He was opposed by the Switzers alone, who had encamped at Marignano, about a league from Milan. History scarcely affords any example of a battle disputed with greater obstinacy than that of Marignano. It commenced about four in the afternoon, in the month of September, and lasted more than three hours after the night had closed in. Weariness and darkness separated the combatants without abating their animosity: the Swiss renewed the charge in the morning with fresh vigour; but they were at length repulsed with cruel slaughter; ten thousand perished on the field, and the rest of their forces retired unbroken and undaunted, and still truly formidable, though defeated. The loss of the conquerors was computed at six thousand men, and the intrepidity of the king exposed him to the most imminent danger. When night suspended the conflict he found himself intermingled with his enemies, and accompanied only by a few attendants. On the carriage of a cannon, completely armed, and anxious for the dawn, he snatched a few moments rest; in every charge he was foremost; his horse was wounded, and his body was covered with contusions; but though his personal prowess stood unrivalled, the victory of the day was chiefly to be ascribed to the constable Charles of Bourbon, whose skill and martial genius were eminently displayed, and whose younger brother the duke de Chatelleraud fell gallantly fighting by his side. Francis displayed his chivalrous turn by receiving knighthood on the field of battle from the celebrated chevalier Bayard. The Milanese afterwards fell under his power, and pope Leo X. thought it advisable to come to an agreement with him. The concordat made on the occasion was so favourable to the pretensions of the Roman see, that it excited considerable opposition in France, but the king's authority overcame all resistance. The ambition of Francis led him to be a competitor for the imperial crown, left vacant by the death of Maximilian in 1519; but the superior interest of Charles V. carried it against him, and the rivalship between these young monarchs began from that time to produce those hostilities which so long disturbed the peace of Europe. To gain Henry VIII. of England to his party, Francis procured that interview between them and their two courts, to which in another article we have lately referred, known by the name of "the field of the cloth of gold" (see France); in which, after a display of unparalleled magnificence at a ruinous expence, no political purpose was effected; for serious business was not allowed to obtrude upon hours devoted to entertainment, and when the monarchs separated, it might be, and probably was, a source of regret and great uneasiness to the French monarch, that a greater sum had been lavished away in this fruitless pageantry than what Charles had distributed to acquire the imperial crown, and who by his bribes and promises to Wolsey easily destroyed all the impression which the frankness of Francis had made upon the mind of Henry VIII. The king next over-ran the kingdom of Navarre, but soon lost it again: in the mean time the Milanese

Milanefe revolted from the French, and expelled them from their country. At this period the conftable Bourbon withdrew his fupport from the French, and even turned his arms againft them. This prince, having defeated Bonnivet, who was fent upon an expedition into Italy, marched at the head of the imperialifts into France, and laid fiege to Marfeilles; but the place held out till it was relieved by the approach of Francis. Relying upon his own prowefs and the ftrength of his armies, the king again croffed the Alps, and invefted the city of Pavia. Here he was attacked, February 24, 1527; but after the greateft exertions of perfonal valour, Francis was obliged to furrender himfelf prifoner. By this defeat France was left without a fovereign, without treafures, and without an army. Ten thoufand of her braveft foldiers had perifhed on the bloody field, and the moft illuftrious of her nobility had facrificed their lives to preferve their honour. Among thefe the leaft regretted was Bonnivet. His fatal counfels had precipitated the national calamity, and his haughty mind fcorned to furvive the public difafter, but rufhing into the thickeft ranks of the enemy, he fell covered with wounds. The firft intelligence of the rout at Pavia was tranfmitted by the king himfelf to his mother in a letter containing thefe memorable words: "Madam, all is loft, except our honour." The royal captive was treated with every mark of refpect, but when he was conveyed to the caftle of Madrid, fuch conditions were impofed, or intended to be impofed, on his releafe, that he refolved to die in captivity rather than accede to them. At length the emperor, finding his health evidently on the decline, paid him a vifit, and concluded a treaty for his liberation, which took place after he had been confined almoft thirteen months. He was exchanged for his two fons in a boat in the midft of a ftream which feparates France and Spain, and inftantly upon touching his own fhore, he mounted his horfe, and waving his hand over his head, cried out "I am yet a king." His firft meafure, on refuming the reins of government, was to form a league with the pope, the Venetians, and the duke of Milan, againft the emperor, and then, without any difficulty, he obtained from the holy pontiff Clement VII. an abfolution from his oath to obferve the treaty of Madrid. And when Charles fent embaffadors to fummon him to the performance of the conditions, Francis, for anfwer, introduced them to an affembly of the ftates of Burgundy, who, as was preconcerted, explicitly declared that he had no right to alienate their country from his crown, and refufed to have them transferred to the emperor's dominion. A war enfued, in the progrefs of which one of the principal actions on the part of the French was the fiege of Naples, which was rendered unfuccefsful by the death of the general and a great part of his army by the plague. The defection of Doria completed the ruin of the French affairs in Italy. At length the peace of Cambray, in 1529, gave a temporary refpite to the hoftilities of the two rivals. By this the children of Francis were reftored to him in confideration of a ranfom of two millions of crowns, and the emperor for the prefent defifted from his claims on Burgundy, but without renouncing his right.

Some years of peace enfued, in which Francis difplayed the character of a fplendid and enlightened prince. The encouragement he gave to literature is a very ftriking feature of his reign. Francis had a real love of learning, and invited many foreign fcholars, among whom was Erafmus, to take up their abode at Paris. He always kept men of fcience and enlightened minds about his perfon, to whom he gave the heads of fubjects on which he defired information, and it was their bufinefs at leifure times, and efpecially at his meals, to read to him what they had drawn up. At the inftigation, and with the affiftance of his learned friends, he collected manufcripts, augmented the royal library, founded a printing-office, and inftituted the college for the learned languages. But he caufed all public acts and law proceedings to be compofed in the French language, inftead of the barbarous Latin before in ufe. Francis was equally a friend to the fine arts; the palace of Fontainbleau, and feveral other edifices are monuments of this reign. To this prince the French court principally owes that free intermixture of the fair fex which has fince conftituted its diftinguifhing luftre and amenity. At the fame time it muft be acknowledged that the king himfelf, by a boundlefs propenfity to gallantry, fet an example, as well of debauchery as of weaknefs; and his favourite miftrefs, the countefs d'Eftampes, enjoyed her power in the ftate as publicly as it was ever afterwards done during the French monarchy. In this reign Britanny was annexed to the crown of France; and the reformation excited in the mind of Francis as much attention as it did in the other princes of Europe. His fifter, the queen of Navarre, was addicted to the new opinions, which were likewife received by many of his fubjects. The king, however, affected a great zeal for orthodoxy, and caufed feveral heretics to be burned, with circumftances of extraordinary cruelty, and probably with as little remorfe as the actors in this favage work would have experienced in any other bufinefs of their lives. A new war broke out between Francis and his rival Charles; this was in the year 1535, and it was continued with great animofity for three years. Francis, to ftrengthen his party, made an alliance with the Turks, a meafure which excited the bittereft reproaches againft him throughout Europe; nor was he himfelf infenfible to the infamy which accompanied his confederacy with infidels againft a Chriftian king. Innumerable obftacles feemed to oppofe a definitive treaty; neverthelefs each prince affected to liften to the exhortations of the Roman pontiff, and Paul at laft prevailed on them to fufpend their hoftile efforts by a truce of ten years. In a very fhort time after this pacification had been agreed upon, the rival monarchs held a conference with the greateft demonftrations of mutual friendfhip and confidence. In the year 1539, Charles, wifhing to vifit the Low Countries, on account of a revolt of the people of Ghent, defired permiffion to pafs through France, and put fo much truft in the king's honour that he refufed any other fecurity for his fafety than his mere word. He farther promifed to confer the duchy of Milan upon the king's fecond fon, the duke of Orleans; Francis, pleafed with this mark of confidence, received Charles at Paris with the greateft magnificence, and gave him every facility in the profecution of his defigns. Charles was not equally liberal, and when he got to his own dominions, he meanly cavilled about his promife, and refufed at laft to perform it. This was the occafion of a new war, in which Henry VIII. joined; peace was however concluded with the emperor in 1544, and with the king of England in 1546.

A difeafe, the fruit of his licentious amours, had long been preying upon the conftitution of Francis, and his life was now embittered by domeftic contention. The enmity and intrigues of his own miftrefs, the duchefs d'Eftampes, and of Diana de Poitiers, miftrefs to the Dauphin, divided the court into open and violent factions. The death of Henry VIII. inflicted a deep wound on the French monarch, who had long known and perfonally loved him: his own diforder continually preyed upon him, he wandered from palace to palace languid and depreffed, and, at length, at Rambouillet he clofed, with much compofure, in the fifty-third year of his age, a reign of thirty-two years, diftinguifhed, as well by its fplendour, and its viciffitudes of fortune, as by its length. He died in March 1547, at a time when he had

had begun to attend more ferioufly to his affairs, and by economy had brought his finances into a good condition. He left two fons and four daughters. Francis was the founder of the houfe of Valois, that being his title when he affumed the crown: on his deceafe the title of *great* was attached to his name, but by pofterity he has not been confidered as meriting this high honour. He oppreffed his fubjects by exceffive impofts, and endangered his kingdom by ambitious projects. Neverthelefs few fovereigns of his country have been more diftinguifhed. The magnificence which accompanied him through life deferted him not in his death: his funeral obfequies were performed with unufual pomp; and the proclamation which announced his death, difplayed his character as "a prince mild in peace, and victorious in war, the father and reftorer of learning and the liberal arts." Moreri. Univer. Hift. Robertfon's Charles V.

Francis II., king of France, eldeft fon of Henry II. by Catherine de Medicis, and grandfon to Francis I. was born in 1544. This prince married, at the age of fifteen, Mary Stuart, the beautiful and unfortunate queen of Scotland. He fucceeded to the crown on the death of his father in 1559, and his reign was marked by violence and diforder, which laid the foundation for thofe civil contentions with which France was fo long afflicted. As his youth rendered him incapable of holding the reins of government, and as he was alfo of a very delicate conftitution, the duke of Guife, and his brother the cardinal of Lorraine, took upon them to govern in his name. Their party was joined by Catherine of Medicis, who had been declared regent. It was, however, her determination to break with the Guifes, whenever fhe fhould find a fit opportunity, and to take the whole adminiftration of government into her own hands. Meafures were foon adopted againft the Proteftants, which excited them to felf-defence. An affociation was formed, and a plot was entered into to get poffeffion of the king's perfon, to banifh or deftroy the Guifes, and to procure liberty of confcience, but it was difcovered and defeated with the death of its acting leader, La Renaudie, though the prince of Condé was fuppofed to be fecretly at the head of the plot. A dreadful revenge was taken by the government, and all were executed who either took, or were fufpected of having taken, any part in it. By this unfuccefsful attempt the power of the Guifes was eftablifhed, and the Proteftant caufe was ftill more obnoxious than it had ever been. In order to appeafe the diforders which were becoming general, an affembly of notables was firft called, which was followed by an affembly of the ftates convoked at Orleans. The king of Navarre, and the prince of Condé, who attended, were put under an arreft, and the latter was tried and condemned to lofe his head. The execution of the fentence was delayed, and to this the prince of Condé was indebted for his life: for the king was fuddenly attacked with a diforder in his head which foon proved fatal; he expired in the eighteenth year of his age and the fecond of his reign. His character, fays the hiftorian, prefents a blamelefs void: he was a king without vice, and almoft without energy enough to produce one virtue. He had acted fo entirely under the controul of others, that fcarcely any thing had appeared of his natural difpofition: and amidft the cabals of the various court interefts, his corpfe was indecently neglected: Catherine, and the Guifes were engaged in extending or in confirming their influence, and the funeral obfequies of the deceafed monarch were only attended by thofe who had been the governors of his education, and the bifhop of Senlis, who had long been blind. Moreri. Univer. Hift. Hift de France.

Francis of Paulo, a Romifh faint, born at Paulo, a town of Calabria, in the year 1416. He was devoted by his parents to a religious life from his birth, and entered accordingly into the Francifcan convent at St. Marks. Having remained there about a year he engaged in various pilgrimages, and then adopted the hermit's life, in a folitary and fecluded fpot not far from his native town; after this he retired to a defert part of the fea-coaft, where he found means to conftruct for himfelf a cell among the rocks. The fame of his abftinence and great fanctity foon drew together a number of difciples, who in the firft inftance built a chapel and a fmall hermitage adjoining his cell; but their numbers rapidly increafing, a monaftery was built on the fpot, which was the firft belonging to the new order, of which the original denomination was that of the "Hermits of St. Francis." The fubject of this article was the founder, and fuperior general of the order, after his inftitute had received the approbation of pope Sixtus IV. in the year 1473. The name of the order was afterwards changed to that of Minims, becaufe the humility of Francis was fuch that he wifhed himfelf and followers to be diftinguifhed by the appellation of "Fratres Minimi." The rules of the order were extremely rigorous, enjoining on the members a perpetual Lent, and great feverity of perfonal difcipline. No one was fo ftrict in conforming to the precepts of the order as the inftitutor himfelf: he allowed himfelf nothing but bread and water: he flept on the bare floor without pillow or covering, and he wore as his ufual drefs a rough hair-cloth next his fkin. Hence he acquired, in thofe days of ignorance and barbarifm, the higheft character for piety and virtue; and fo great was the opinion entertained of his fanctity, and of the prevalence of his interceffions with heaven, that when Lewis XI. of France was attacked by a dangerous diftemper, he fent for Francis out of Calabria, hoping to obtain a cure by virtue of his prayers. The faint at firft refufed to comply with the royal demand, and was at laft induced to fet out on the journey by an exprefs order from the pope. He was received by Lewis with the greateft honour, and had apartments affigned to him in the palace, and after the death of the king, his fucceffor Charles VIII. built a convent for Francis and his monks in a park belonging to that palace. Here he died, in 1507, at the advanced age of ninety-one years. He was highly applauded for his fanctity, but was a total ftranger to literature: the aufterities which he practifed upon himfelf ftood in ftead of every other accomplifhment. In 1519 he was canonized by pope Leo X. Moreri.

Francis Xavier, a Romifh faint, ftyled "the Apoftle of the Indians," was fon of John Jaffe, a gentleman of Navarre, and born at the chateau of Xavier, at the foot of the Pyrenees, in the year 1506. Having attained a competent ftock of claffical learning, he was fent to Paris, where he went through a courfe of philofophy, and took his degrees. Some time after this he undertook to teach philofophy in the college of Beauvais, until he became acquainted with the famous Ignatius Loyola, with whom he folemnly embarked in a new undertaking, for promoting the interefts of the catholic faith, particularly by the converfion of infidels. From this time he renounced all profpect of any eftablifhment in the world, and applied himfelf diligently to the ftudy of theology. In the year 1537, he quitted Paris, and went to Venice, where Loyola, who had taken a journey into Spain to fettle fome affairs, met him and the reft of his companions. He next went to Rome, where he obtained leave of the pope for himfelf and others to embark on a miffion to the holy land, and alfo to be admitted to prieft's orders. They were, however, prevented from undertaking the voyage by the reftrictions which the grand feignior had laid on the admiffion of pilgrims and miffionaries into Paleftine. They, therefore,

turned their thoughts to increafing their numbers from among the members of the different Italian univerfities, in preaching and inftructing young perfons, and in laying the foundation of the famous fociety of Jefus. Almoft as foon as the pope had given his fanction to the eftablifhment of this new order, John III. king of Portugal applied to the holy fee of Rome for miffionaries to be fent to propagate the catholic faith in the Eaft Indies. Francis Xavier was one of the perfons felected for this arduous enterprize; he embarked at Lifbon for the Indies in 1541, and in the following year arrived at the Portuguefe fettlement at Goa, where he laboured inceffantly in fpreading the knowledge of the catholic faith in that city, the fouthern continent of India, Malacca, the Molucca iflands, and Japan. Many became converts to chriftianity, and at Japan, Francis Xavier, with wonderful rapidity, laid the foundation of the catholic church, which flourifhed for many years in that vaft empire. From Japan he went to China, but was taken fick on his voyage, and died in fight of the empire in 1552, in the forty-fixth year of his age. As an author he is known by five books of "Epiftles," publifhed at Paris in 1631; "a catechifm," and fome other fmall pieces. He was beatified by pope Paul V. in 1613, and canonized by his fucceffor pope Gregory XV. in 1662.

Francis de Borgia, a Romifh faint, born about the year 1511, was grandfon of pope Alexander VI. and hereditary duke of Candia. He was by birth a Spaniard, obtained the viceroyfhip of Catalonia, and from his connections he might have obtained the higheft honours of the ftate; but he grew difgufted with the world, and determined to embrace the ecclefiaftical life. He became a member of the fociety of Jefus in 1548, and, in 1565, he was raifed to the poft of general of that order. He frequently declined valuable ecclefiaftical dignities, as well as the high honour of the cardinalate, and dedicated his whole time and labour to the advancement of the interefts of the fociety. By the exprefs wifh of pope Pius VI. he accompanied his nephew cardinal Alexandrinus, whom he fent legate into Spain, Portugal, and France. He died at Rome in 1572, in the 62d year of his age, having been canonized the year before. He was author of feveral theological and devotional pieces written in the Spanifh language, which were afterwards tranflated into Latin, and publifhed in folio at Bruffels in 1675. Moreri.

Francis de Sales, a faint and founder of the religious order of the "Vifitation," was born at Sales, near Geneva, in the year 1567, and was educated partly at Annecy and partly at the univerfity of Paris. He was intended for the profeffion of the law, but this not being congenial to his mind he embraced the ecclefiaftical life. He foon became diftinguifhed as a popular preacher, and poffeffed a moft ardent zeal in the converfion of heretics, and on that account was fent by his bifhop on miffions into the valleys of his diocefe, to endeavour to bring back the difciples of Zuingle and Calvin into the true church. He was afterwards appointed coadjutor to the bifhop of Geneva, and was confecrated under the title of bifhop of Nicopolis. Having occafion to take a journey to Paris, the moft handfome offers were made him by Henry IV. but he declined the appointment, as he did alfo the honour of a cardinalate. On the death of the bifhop of Geneva, he was called to the full exercife of the epifcopal functions in that diocefe, when he applied himfelf with great diligence to the reformation of abufes among the clergy, and united in his own perfon, to the character of a vigilant ecclefiaftical fuperintendant, that of a good paftor, and benevolent friend of the people committed to his care. In every cafe of diftrefs he was ready to afford his affiftance, and in his own life he exhibited a large fhare of piety, purity, candour, and unaffected fimplicity and urbanity. Still the moft prominent traits in his character were the zeal and activity which he exhibited in winning over the proteftants to the catholic faith. He is faid to have been the means of reconciling above 70,000 heretics to the church of Rome, during the ten years before his fucceffion to the epifcopate of Geneva; and after that event he perfevered in the fame courfe with equal diligence and proportionate fuccefs. In the year 1610, he eftablifhed, in conjunction with madame de Chantal, the order of the "Vifitation," for female devotees, of which the firft inftitution was fixed at Annecy. In 1622, the bifhop received an order from the duke of Savoy to proceed to Avignon, to be prefent at an interview between that prince and Lewis XIII. of France. From hence he went to Lyons, where he died in the fifty-fifth year of his age. He was canonized by pope Alexander VII. in the year 1665. As an author he is known by many devotional pieces highly efteemed by the catholics. Thefe have been collected and publifhed in two volumes folio. Moreri.

Francis, or Franciscus de Victoria, a celebrated Spanifh divine in the 16th century, purfued his ftudies at Paris, where he took his degrees. He entered into the order of the Dominican preaching friars, was appointed profeffor of theology, and delivered lectures at Salamanca and other celebrated Spanifh univerfities. His works as an author have been highly prized in the catholic world; but the moft important of them is a collection of theological and moral lectures, entitled Theologicæ Prælectiones XIII. in two volumes, which have obtained the critical notice of Dupin. He died at Salamanca in the year 1549. Moreri.

Francis de Jesus-Maria, a learned Spanifh carmelite monk of the reformed order of St. Therefa, who flourifhed in the 17th century, was a native of Burgos in Old Caftile. He obtained the high office of definitor-general; was author of "Curfus Theologiæ moralis Salmanticenfis;" and of "Commentaries on the Apocalypfe" publifhed at Lyons in 1648, in two volumes folio. He died in 1677.

Francis, *St.* in *Geography*, a lake, or extenfion of the river St. Lawrence, between Kingfton and Montreal, through which paffes the line dividing Upper from Lower Canada.—Alfo, a river in the province of Lower Canada, which rifes from various fources near the northern boundary of the United States, and runs northward into the river St. Lawrence, at the W. end of lake St. Peter. If it were all the way navigable, it would afford an important communication from the northern parts of Vermont, to the markets of Montreal and Quebec. Its banks are fertile, and accommodate fettlers, who refort thither from New England.—Alfo, a fmall river in Louifiana, which purfues a S. E. courfe into the Miffiffippi, 108 miles above Arkanfas river, and 70 miles above Margot river on the E. fide of the Miffiffippi. It is the general rendezvous for the hunters from New Orleans, who winter there, and collect falt meat, fuet, and bear's oil, for the fupply of that city.—Alfo, the name of a fmall river in the W. territory, which runs a S. W. by W. courfe into the Miffiffippi, between Cold and Rum rivers, 60 miles above S. Anthony's Falls. The country above it is hilly, and the foil tolerably good. To the N. E. are the fmall lakes called the Thoufand Lakes. Here the Miffiffippi is not above 90 yards wide.

FRANCISCANS, in *Ecclefiaftical Hiftory*, are religious of the order of St. Francis, founded by him in the year 1209. Francis was the fon of a merchant of Affifi, in the province of Umbria, who, having led a diffolute life, was reclaimed by a fit of ficknefs, and afterwards fell into an

extravagant kind of devotion, that looked lefs like religion than alienation of mind. Soon after this, *viz.* in the year 1208, hearing the paffage repeated, Matt. x. 9, 10. in which Chrift addreffes his apoftles, "Provide neither gold nor filver, &c." he was led to confider a voluntary and abfolute poverty as the effence of the gofpel, and to prefcribe this poverty as a facred rule both to himfelf and to the few that followed him. This new fociety, which appeared to Innocent III. extremely adapted to the prefent ftate of the church, and proper to reftore its declining credit, was folemnly approved and confirmed by Honorius III. in 1223, and had made a confiderable progrefs before the death of its founder in 1226. Francis, through an exceffive humility, would not fuffer the monks of his order to be called *fratres*, *i. e.* brethren, or friars, but *fraterculi*, *i. e.* little brethren, or friars-minor, by which denomination they ftill continue to be diftinguifhed. They are alfo called *grey friars*, on account of the colour of their cloathing, and cordeliers, &c. The Francifcans and Dominicans were zealous and active friends to the papal hierarchy, and, in return, were diftinguifhed by peculiar privileges and honourable employments. The Francifcans, in particular, were invefted with the treafure of ample and extenfive indulgences, the diftribution of which was committed to them by the popes, as a means of fubfiftence, and a rich indemnification for their voluntary poverty. In confequence of this grant, the rule of the founder, which abfolutely prohibited both perfonal and collective property, fo that neither the individual nor the community were permitted to poffefs either fund, revenue, or any worldly goods, was confidered as too ftrict and fevere, and difpenfed with foon after his death. In 1231, Gregory IX. publifhed an interpretation of this rule, mitigating its rigour; which was farther confirmed by Innocent IV. in 1245, and by Alexander IV. in 1247. Thefe milder alterations were zealoufly oppofed by a branch of the Francifcans, called the *fpiritual;* and their complaints were regarded by Nicholas III. who, in 1279, publifhed a famous conftitution, confirming the rule of St. Francis, and containing an elaborate explication of the maxims it recommended, and the duties it prefcribed. In 1287, Matthew of Aqua Sparta, being elected general of the order, difcouraged the ancient difcipline of the Francifcans, and indulged his monks in abandoning even the appearance of poverty; and this conduct inflamed the indignation of the fpiritual or aufterer Francifcans; fo that from the year 1290, feditions and fchifms arofe in an order that had been fo famous for its pretended difintereftednefs and humility. Such was the enthufiaftic frenzy of the Francifcans, that they impioufly maintained, that the founder of their order was a fecond Chrift, in all refpects fimilar to the firft; and that their inftitution and difcipline were the true gofpel of Jefus. Accordingly, Albizi, a Francifcan of Pifa, publifhed a book in 1383, with the applaufe of his order, entitled, "The Book of the Conformities of St. Francis with Jefus Chrift." In the beginning of this century the whole Francifcan order was divided into two parties; the one embracing the fevere difcipline and abfolute poverty of St. Francis, were called *fpirituals;* and the other, who infifted on mitigating the auftere injunctions of their founder, were denominated "brethren of the community." Thefe wore long, loofe, and good habits, with large hoods; the former were clad in a ftraight, coarfe, and fhort drefs, pretending, that this drefs was enjoined by St. Francis, and that no power on earth had a right to alter it. Neither the moderation of Clement V. nor the violence of John XXII. could appeafe the tumult occafioned by thefe two parties; however, their rage fubfided from the year 1329. In 1368 thefe two parties were formed into two large bodies, comprehending the whole Francifcan order, which fubfift to this day; *viz.* the "conventual brethren," and the "brethren of the obfervance, or obfervation," from whom fprung the Capuchins and Recollects. Mofh. Eccl. Hift. vol. iii. See alfo *Nuns of St.* CLARE, and FRIARS. The general opinion is, that the Francifcans came into England in the year 1224, and had their firft houfe at Canterbury, and their fecond at London; but there is no certain account of their being here till king Henry VII. built two or three houfes for them. At the diffolution of the monafteries, the conventual Francifcans had about fifty-five houfes, which were under feven cuftodies, or wardenfhips; *viz.* thofe of London, York, Cambridge, Briftol, Oxford, Newcaftle, and Worcefter.

FRANCISCO DE TRADO, in *Geography*, a town of Brazil; 80 miles S. E. of Pauxis.

FRANCISCO, *St.* a river of Brazil, which difembogues itfelf into the bay of Vafabarris, fouthward of Fernambuco, occafioning fuch eddies to the diftance of three or four leagues from the land, that few veffels which approach near the fhore in this bay efcape ftranding. About 30 leagues inland this river lofes itfelf, running under ground for feveral miles, and again makes its appearance. On the banks of this river there are feveral villages, and large plantations, from which the inhabitants fend annually great quantities of fugar, tobacco, and mandioc to Fernambuco, exchanging thefe commodities for cloathing and implements of hufbandry. The bar of the river has not above eight feet of water upon it, fo that they are obliged to ufe fmall fchooners for the convenience of exporting their goods.

FRANCIUS, PETER, in *Biography*, a celebrated Greek and Latin poet, was born at Amfterdam in 1645. Here and at Leyden he purfued his ftudies under Hadrian Junius, and Gronovius, with whom he entered into a moft intimate friendfhip. In 1669, he made a tour to England, from whence he proceeded to France, where he obtained the degree of doctor of laws. He formed an acquaintance with many of the moft learned men of the age in which he lived; was treated with high refpect by the grand duke at Florence, and at Rome he was vifited by the principal people of the city. In 1674, the magiftrates of Amfterdam appointed him profeffor of hiftory and rhetoric, and, in 1692, he was invited to be profeffor of Greek, which he declined, and continued to difcharge the duties of his office at Amfterdam till his death in 1704. He was deeply fkilled in Latin poetry and oratory, though fome excellent judges have thought more highly of his Greek verfes than of thofe which he compofed in Latin. His oration, "De Præftantia Linguæ Græcæ," poffeffes great merit. Many of his poems were written on William III. king of England; Frederic-William, elector of Brandenburg, and his fon, the firft king of Pruffia; and after his death a number of gold coins and other valuable prefents, which he had received from thefe and other princes and great men were found among his property. His works are numerous, and confift chiefly of poems, orations, and differtations. Gen. Biog.

FRANCK DE FRANCKENAU, GEORGE, was born at Naumburg, in Upper Saxony, on the third of May 1643. His father, although living as a fimple peafant, was of a noble family. After going through his fchool-education, George went to Jena at the age of 18, and was crowned a poet by count palatine Richter, in confequence of his extraordinary talent for writing verfes in the German, Latin, Greek, and Hebrew languages. But he exhibited ftill greater talents during his courfe of medical ftudies; and the canons of Naumburg, who recognized his merits, afforded

him liberal means of subsistence while he applied himself to this science. He made such good use of their money and his time, that he was deemed eligible to give lectures in botany, chemistry, and anatomy, before he obtained the degree of doctor, which, after having fulfilled these duties, he received at Strasburg in 1666. He continued his progress in the cultivation of his profession with great success; and the progressive increase of his reputation was at once the result and the recompence. In 1672, the elector palatine appointed him to the vacant professorship of medicine at Heidelberg, and a few years afterwards nominated him his own physician. But the troubles occasioned by the war compelled Franck to leave Heidelberg in 1688, and he retired to Francfort on the Main. John George III., elector of Saxony, then received him into his service, and appointed him professor of medicine at Wittemberg; an office which he filled with so much eclat, that the principal professorship, and the title of dean of the faculty at Leipsic, were soon offered to him. This, however, he refused, by the instigation of his friends, who sought to retain him at Wittemberg. The two succeeding electors likewise loaded this physician with so many favours, that it was supposed he could never dream of quitting Heidelberg. Nevertheless he was induced, by the offers of Christian V. king of Denmark, to remove to Copenhagen, where he was received most graciously by the royal family, and was honoured with the title of Aulic counsellor, which was continued to him by Frederick IV. the successor of Christian. Death, however, terminated his brilliant career on the 16th of June 1704, in the 60th year of his age.

Franck was a member of several learned societies, and was ennobled by the emperor Leopold in 1692, and in 1693 was created count palatine, by the title of "De Franckenau." He wrote many works, but it will be sufficient to enumerate the titles of those which have obtained the most extensive circulation. 1. "Institutionum Medicarum Synopsis," Heidelberg, 1672. 2. "Lexicon Vegetabilium usualium," Argentorati, 1672. This was republished several times. In the edition of Leipsic 1698, the title of "Flora Francica" was given to it. 3. "Bona nova Anatomica," Heidelberg, 1680. 4. "Parva Bibliotheca Zootomica," ibid. 1680. 5. "De calumniis in Medicos et Medicinam," ibid. 1686. 6. "De Medicis Philologis," Wittebergæ, 1691. 7. "De palingenesia, sive resuscitatione artificiali plantarum, hominum, et animalium, è suis cineribus, liber singularis," Halæ, 1717, edited by Nehring. 8. "Satyræ Medicæ XX." Leipsic, 1722. These pieces, which had begun to appear in 1673, were published by his son, George Frederick Franck, who was also a teacher of medicine at Wittemberg, and wrote several works on botany and physic. Eloy. Dict. Hist.

FRANCKE, Augustus Herman, a learned German Lutheran divine, was born at Lubeck in 1663, where he received the early parts of his education, and, in 1679, he was sent to the university of Erfurt, and from thence to Kiel, in both which places he distinguished himself by his diligence and improvement. In 1682, he spent some time at Hamburgh, to perfect himself in the Hebrew language under a learned Jew in that city, and then went to Gotha, whence, in 1684, he proceeded to Leipsic, where, in the following year, he was admitted to the degree of M. A. Here, after he had been at Wittemberg and Lunenburg for improvement, he delivered lectures on the scriptures, in which he combined critical discussion with practical and useful reflections. His popularity was so great as a lecturer, that he is said to have had frequently 300 students, but from some causes not distinctly ascertained, he was obliged to relinquish his lectures, and to withdraw from the university. No imputation was ever made to affect his moral character, and, in 1690, he was called upon to undertake the office of minister of one of the churches of Erfurt, but through jealousy of his superior talents he was in a few months deprived of that situation, and ordered to quit the place. Upon this event, which was marked with injustice, the court of Gotha, satisfied of his innocence and of his merit, immediately offered him a choice of preferments, but having received, at the same time, an invitation from the elector of Brandenburg, to become professor of the oriental and Greek languages in the university at Halle, he gave the preference to this; which, however, he soon resigned for the professorship of divinity. He now employed his talents in instructing the poor, and engaged, at his own expence, a student in the university to assist in the same plan. Soon after, he extended his project, and formed an establishment, to be supported by voluntary contributions, in which orphans, and other necessitous children, should be instructed and supported, until they were qualified to be sent out into the world. This was the commencement of the hospital, or house of orphans at Halle; an institution that has been of essential service to the interests of humanity and good morals in Germany, and has rendered the memory of Francke highly respected. He lived to see this institution flourish in such a manner as abundantly to repay all his labours: provision was made in it, and in others connected with it, for more than two thousand children. Having provided for their necessaries, he began to contrive plans for the enlargement of their studies: he established a printing office, and furnished it with the means of printing books in all languages, even those that are least generally known; a museum of natural curiosities, and a numerous library. The zeal and activity manifested by Mr. Francke in his benevolent schemes injured his health so much, that he was obliged to seek relief from foreign travel: this seemed, for a time, to stop the progress of disease; nevertheless his infirmities were evidently increasing, and though they did not, for the present, incapacitate him entirely for public duty, yet they prevented him from any considerable exertions, and, in 1727, he died in the 65th year of his age, regretted by all ranks in Germany, for the noble services which he had rendered his country and the world. He was author of many theological works, several of which were intended to explain and illustrate the books of the Old and New Testament. Moreri.

FRANCKEN, or Francks Franciscus, commonly called *Old Franck*, a native of Flanders, who practised historical painting with very considerable success in a small style of proportion. His birth is fixed in 1544, but when he died is uncertain, but supposed to be in 1616, at the age of 72.

He possessed the power of invention, and composed with great ease the subjects he chose for representation, which were generally from the Old or New Testament. He seems to have imagined it to be the quintessence of art, to introduce as many figures as possible into his pictures; and besides this he had the fault of the time he lived in, *viz.* introducing several points of time, or parts of the history of his heroes, into one picture. Excepting these defects, his works are worthy of admiration for the ingenuity of the execution. At Wilton is a work of his representing Belshazzar's feast, which is beautifully wrought; but the composition is exceedingly confused from the number of the figures and the management of the lights. It could not well be more so if the painter's head had been filled with the vapours of Belshazzar's wine.

Francken, or Francks Franciscus, commonly called

Young Franck, fon of the preceding, was born in 1580, and followed his father's profeffion as hiftorical painter, in the fame ftyle and manner, but with confiderable improvement in colour and expreffion; and his defigns were conducted with more elegance and greater clearnefs, though ftill with the fault of having often too many hiftorical incidents in one picture, reprefenting by that means a feries of incidents, inftead of one principal action or event.

After ftudying fome time with his father, he travelled to Venice to improve his tafte in colouring. There he copied, and attentively ftudied, the works of the great artifts that had been, and were then employed in adorning that city. At his return to Flanders he was greatly admired and encouraged, though he does not appear to have carried back with him much of the tafte of the Venetian, or any of the Italian fchools; but continued the practice of his father, painting fmall hiftories with a great number of figures, touched with great neatnefs, freedom, and fpirit.

He had a peculiar mode of giving brilliancy to the eyes of his figures by a fmart touch of pure white upon them, which diftinguifhes his pictures, and ferves as a guide to the connoiffeurs. The works of the father and the fon are often confounded and miftaken for each other, fo fimilar are they in conception and execution. Young Franck died in 1642, aged 62.

Francken, Christian, a learned German unitarian divine, was born, about the middle of the fixteenth century, at Gardleben, a town of Brandenburg. His parents were of the Lutheran perfuafion, but he himfelf, at an early period of life, became a convert to popery, and entered the order of the Jefuits in the year 1568. He was fent to Rome to go through his noviciate, and, after fpending fome years in Italy, was recalled to Germany, where he manifefted much zeal in oppofing the heterodox doctrines that were then fpreading in all directions. At Vienna he was appointed profeffor of philofophy, and in this fituation he became convinced that the doctrines of popery were unfcriptural and highly erroneous, refigned his office, and withdrew to his native town. He is faid after this to have been wavering as to the courfe he fhould adopt, and defirous of returning into the bofom of the church which he had juft openly abandoned. At length, however, he joined himfelf to the unitarians in Poland, and became a ftrenuous advocate for the opinions maintained by Francis David, and entered into a controverfy with Socinus on the fubject. See David. In 1584 he publifhed an account of this difpute, which was afterwards republifhed by Socinus with notes, remarks, and many corrections. From this period to 1590, Francken was at the head of an unitarian feminary firft at Chelmnitz, and afterwards at Tranfylvania. From this place he went to Prague, where he is reported to have returned again into the communion of the Catholic church. He next went to Ratifbon, where he was patronized by Ladiflaus Popelius, one of the emperor's officers, who was zealoufly attached to philofophical purfuits. In this place, and under this protection, he publifhed his "Analyfis Rixæ Chriftianæ, quæ Imperium turbat, et diminuit Romanum." From this period we learn nothing more of him: he was author of many theological pieces, and of a fevere fatire on the Jefuits, entitled, "Breve Colloquium Jefuiticum, toti orbi Chriftiano, ad recte cognofcendam hactenus non fatis perfpectam Jefuitarum Religionem, utiliffimum, habitum à Sacræ Theologiæ Doctore et Profeffore Paulo Florenio cum Chriftiano Francken, &c." Moreri. Toulmin's Life of Socinus.

FRANCKLIN, Thomas, was born in London about 1720. He was educated at Weftminfter, and at Trinity college Cambridge, where he diftinguifhed himfelf in his ftudies. His father, as printer and publifher of the Craftfman, was fupported by Bolingbroke, Pulteney, and others, and from thefe he hoped for fome provifion for his fon, but was difappointed. The young man became fellow of his college, and was firft known as an author in 1749, by a tranflation of "The epiftles of Phalaris," and of one of "Cicero on the nature of the Gods." In 1750, he was elected to the Greek profefforfhip in the univerfity of Cambridge; and, in 1758, he was prefented with the livings of Ware and Thunbridge in Hertfordfhire. In the following year he publifhed one of his moft confiderable works, *viz.* "A Tranflation of all the Plays of Sophocles," in two volumes 4to. which have fince been printed in the octavo fize. In 1767, he was nominated one of the king's chaplains, and took the degree of D.D. in 1770; he ftill continued his literary occupations, and even wrote a farce for the ftage; but the conclufion of his labours was a tranflation of "The works of Lucian," in two vols. 4to. 1780, which is thought to give the Englifh reader a good idea of the humour and vivacity of that celebrated writer. To this tranflation was prefixed "A dialogue between Lucian and lord Lyttelton in the Elyfian Fields," intended as an account of the life and character of Lucian. In his latter years Dr. Francklin held the living of Brufted in Kent. As a clergyman he was author of feveral fingle fermons; of a volume of "Difcourfes on the Relative Duties;" and of "A letter to a bifhop concerning Lectrefhips," pointing out, in ftrong terms, the difgraceful fteps that are often taken in procuring thofe offices. Gen. Biog.

FRANCKS, or Vranx, John Babtist, a painter of hiftory and converfations. He was born at Antwerp in 1600. At firft he made the works of Vandyke and Rubens his ftudy, but never fucceeded to any high degree of excellence. He was moft fuccefsful in reprefenting interiors of galleries or grand apartments ornamented with ftatues and pictures, with perfons engaged in different ways, either in converfation, play, or concerts of mufic. Thefe fubjects he defigned and executed extremely well, finifhing them with a neat and agreeable pencil; but he was not fufficiently fkilful in the arrangement and due fubordination of lights, fo that his effects are frequently confufed.

Houbraken defcribes one of his works of this kind as being truly excellent. It reprefents the interior of a grand apartment or cabinet of a curious perfon, decorated with bufts and other ornamental furniture elegantly difpofed, with pictures arranged upon the wall; which are fo admirably finifhed, that the tafte of the mafters, whofe works they are fuppofed to be, is diftinguifhable. There are only two figures in the apartment, which are portraits of Rubens and Vandyke engaged in playing at tables. The likeneffes of thefe artifts are greatly commended, and the delicacy of touch with which they are executed.

FRANCO, Magister, fcholaftic of the cathedral of Cologne; a very important perfonage in the hiftory of mufic, whofe merit had lain dormant many ages buried in MSS. which had never entered the prefs, nor would it have been known to modern muficians that he ever exifted, but for the general refearch in the principal libraries of Europe after materials for a general hiftory of mufic.

Magifter Franco is by fome called a native, or at leaft an inhabitant of Paris; by others a fcholaftic of Liege; but if we may believe Franco himfelf, he was of Cologne; for, feeming to forefee the difputes which would arife concerning his locality, he begins his "Compendium de Difcantu," one of his mufical tracts which has been preferved, in the following manner: "Ego Franco de Colonia, &c." which, if the

authors of the "Hiſtoire Litteraire de la France" had ſeen, they doubtleſs would not have fixed him at Liege, nor would thoſe who have implicitly followed them, have been led into this miſtake.

Sigebert tells us that Franco ſupported the functions of his office of ſcholaſtic, or preceptor, by a great fund of religion and knowledge: and acquired as much celebrity by his virtue as ſcience: "Scientia literarum et morum probitate clarus." He ventured, ſay the Benedictines, to ſtudy profane ſcience as well as eccleſiaſtic, and had the courage to attempt ſquaring the circle. Chriſtian philoſophers generally regard a man for loſt who addicts himſelf to ſuch purſuits as the ſquaring of the circle, the multiplication of the cube, perpetual motion, the philoſopher's ſtone, judicial aſtrology, or magic. But Franco is ſaid to have exerciſed his faculties in theſe ſtudies with ſuch diſcretion, that he never neglected his more important concerns.

By the teſtimony of Sigebert, his cotemporary, he had acquired great reputation for his learning in 1047. At leaſt it is certain that he had written concerning the ſquare of the circle before the month of February 1055, at which time Heriman, archbiſhop of Cologne, to whom he dedicated his work, died.

Franco lived at leaſt till Auguſt 1083, for he at that time filled the charge of ſcholaſtic of the cathedral of Liege.

Among many works which Franco is ſaid to have produced upon religious and mathematical ſubjects, we are told by the authors of the "Hiſtoire Litteraire de la France," that he wrote upon muſic and plain-chant; and that in the abbey of Lire in Normandy, there is a manuſcript in folio, which contains "Ars Magiſtri Franconis de Muſica Menſurabili." Theſe writers add, that there can be no doubt of this Magiſter Franco being the ſame as the ſcholaſtic of that name; or that another tract on muſic, in ſix chapters, entitled "Magiſtri Franconis Muſica," and preſerved in the Bodleian library at Oxford, is by the ſame author, as well as the "Compendium de Diſcantu, tribus capitibus," in the ſame library.

Theſe authors, who indeed pretend not to have ſeen the muſical tracts of Franco, have imagined, contrary to their uſual accuracy, that the treatiſe "De Muſica Menſurabili," in the library at Lire, and "Muſica Magiſtri Franconis," in the Bodleian library, were different works, but there remains not the leaſt doubt of their being duplicates of the ſame tract, in every reſpect, but their titles.

Trithemius, who calls him Franco Scholaſticus Leodienſis Eccleſiæ, of the church of Liege, natione Theutonicus, and a German, tells us, that "he was very learned in the holy ſcriptures; a great philoſopher, aſtronomer, arithmetician, (computiſta;)" and that he dedicated ſeveral of his works to the archbiſhop of Cologne: ſuch as his tract "De Quadratura Circuli;" "De Computo Eccleſiaſtico; et alia plura;" but he ſpecifies none of the muſical writings of Franco, who, according to this biographer, flouriſhed under the emperor Henry III. 1060.

The firſt mention however which we can find of Franco as a writer on muſic in any treatiſe on the ſubject is in the "Lucidarium in Arte Muſicæ planeæ," by Marchetto da Padova, written in the year 1274, who ſays that the agreement of different melodies, according to Magiſter Franco, conſtitutes diſcant ("diſcantus ſecundum Magiſtrum Franconem, eſt diverſorum cantum conſonantia. Ex. cod. Vatic. Num. 5322.") He likewiſe cites him in his "Pomœrium de muſica menſurata," as an *inventor* of the four firſt muſical characters. (Muratori Antiq. Med. Ævi Diſſert. 24. tom. ii. Padre Martini, tom. i. p. 189. Gerb. tom. ii. p. 124.) And this would have been ſufficiently early to have ſtript John de Muris of the honour of their invention, had he choſen to inveſt himſelf with it. He is next in point of time mentioned by John de Muris himſelf, and in a MS. of the Bodleian library (Digby 90) aſcribed to Thomas, or John of Tewkſbury, which, it is ſaid at the end, was finiſhed at the univerſity of Oxford, 1351. There is a chapter expreſsly on the muſical characters for time, invented by Franco: "De figuris inventis a Francone."

Franchinus Gaforius, Pract. Muſicæ, lib. ii. c. 5. quotes him twice as author of the time-table; and aſcribes to him, ib. lib. iii. c. 1. the completion of counterpoint, by his contrivance of moving in different melodies at the ſame time: meaning his invention of muſical characters for meaſure.

Our countryman Morley, Annotations to his Introduction, p. 7. ſays that "Franco was the moſt ancient of all thoſe whoſe works on practical muſic had come to his hands." But he ſeems only to have ſeen a commentary on his treatiſe by Robert de Handlo, and to know nothing of his age and country. Robert de Handlo wrote a commentary on the "Muſica Menſurabilis of Franco," 1326. (See Tanner, p. 376.) And this is even an earlier period than was aſſigned to the invention by thoſe who had given it to John de Muris. And Ravenſcroft, "Briefe diſcourſe of the true uſe of charactering the degrees in Meaſurable Muſicke, 1614," p. 1. who appears indeed to have been no better acquainted with the original than Morley, quoting him only through John Dunſtable, an Engliſhman, Id. p. 3. tells us boldly, that he was the inventor of the four firſt ſimple notes of menſurable muſic; but, unluckily, calls him Franchinus de Coloniâ, confounding him with Franchinus Gafurius.

Critical exactneſs, with reſpect to dates, names, or facts, was not yet much practiſed in writing upon the arts; and Morley, the beſt author who had written expreſsly on muſic, in our language, ſince the invention of printing, took many things upon truſt; and though he gave a long liſt of practical muſicians, whoſe works he had conſulted, he never had ſeen the writings of Guido, nor does he quote a ſingle manuſcript treatiſe throughout his introduction, which indeed is profeſſedly more didactic than hiſtorical.

We have been the more ſolicitous to eſtabliſh the exiſtence of Franco, and the time when he flouriſhed, as muſical writers have been ſo long in the habit of aſſigning to John de Muris the invention of the time table, or muſical notation, by copying each other without further enquiry, that they ſeem unwilling to ſtrip him of an honour which they themſelves have ſo gratuitouſly conferred upon him.

Having collected the evidence of reſpectable and unſuſpected writers in favour of the muſical tracts of Magiſter Franco, it will be neceſſary to give the reader an account of the particular treatiſes which chiefly concern the "Ars Cantus Menſurabilis:" and this we ſhall do from the work itſelf, of which we obtained a tranſcript from the Bodleian library at Oxford (842—49.)

This ſhort, but celebrated tract, contains ſix chapters: 1. Prologue, and definitions of the terms uſed in the treatiſe. 2. Of the figures, or repreſentations of ſingle ſounds. 3. Of ligatures, or compound notes. 4. Of reſts or pauſes. 5. Of the different concords uſed in diſcant. 6. Of the organum, and of other combinations of ſounds.

In ſpeaking of former muſical writers, he ſays, "that both the theory and practice of plain muſic, or chanting, had been ſufficiently explained by ſeveral philoſophers; particularly the theory by Boethius, and the practice by Guido," whom he exalts into a philoſopher. "The eccleſiaſtical tropes or modes," he adds, "had been ſettled by St. Gregory." Franco, therefore, only intends to treat

treat of meaſured muſic, of which, he piouſly obſerves, plain-chant has the precedence, as the principal of the ſubaltern. "Nor let any one ſay," continues he, "that I have undertaken this work through arrogance, or for my own convenience, but merely for the ſake of its evident truth, the eaſe with which it may be comprehended by the ſtudent, and its containing the moſt perfect method of teaching all the modes of meaſured muſic, and their notation. For as there are ſeveral authors, as well modern as ancient, who in their treatiſes give many good rules concerning meaſured muſic, and on the contrary are deficient and erroneous in other particulars, eſpecially in the appendages of the ſcience, we think their doctrines require ſome correction and improvement, leſt the ſcience itſelf ſhould ſuffer from their errors and defects. We therefore propoſe giving a compendious explanation of meaſured muſic, in which we ſhall not ſcruple to inſert *what others have ſaid well on the ſubject*, to correct their errors, and to ſupport by good reaſons *whatever we ourſelves may have newly invented.*"

It ſeems evident from this paſſage, particularly thoſe parts of it which are printed in italics, that the invention of muſical notes for time, is more ancient than Franco, and that he had only the merit of improvement. It likewiſe informs us, that there were, in his time, treatiſes "de Menſurabili Muſicâ," or, at leaſt, that doctrines had been propoſed and laid down concerning muſical notes, and the different duration of ſounds, by writers who were *antiqui*, with reſpect to him; and proves very ſtrongly that this manuſcript contains only a mixture of his own rules, with thoſe of his predeceſſors. And indeed, upon a careful analyſis of this whole tract, it does not appear that Franco was the inventor of muſical notes, or characters for time, though they have lately been given to him in ſuch very poſitive terms, by thoſe who, without ſeeing his manuſcript, have taken it for granted that it was wholly his property, becauſe no other writer of equal antiquity was found to have treated of cantus menſurabilis. Indeed, beſides the paſſages already cited, we find him ſpeaking of former writers, and former opinions concerning the notes and modes; particularly, chapter ſecond, the words *quemadmodum quidam poſuerunt*, acknowledge other writers upon the ſubject of meaſured muſic beſides himſelf; and, chapter the fourth, he ſpeaks of the great error which *ſome* have committed by tying together three *longs* in tenor parts; and of the ſtill greater blunder which *others* have made in tying a *long* between two breves. And the author of a Latin treatiſe, which was among the Cotton muſical manuſcripts, ſeems to determine with great preciſion the degree of merit that is due to Franco, with reſpect to the time-table; for ſpeaking of the canto fermo of an earlier period, he ſays: "Though muſic was at that time not meaſured, it was approaching *towards* meaſure, when Franco appeared, who was the firſt approved author, or writer, on meaſured muſic." After this introduction, definitions are given in which we ſhall mention whatever ſeems ſingular or curious. Meaſured muſic, he ſays, is regulated by long and ſhort times, or portions of meaſure; and meaſure he defines, the regulated motion of any ſeries of ſounds, whether quick or ſlow, different from plain-ſong, in which no ſuch regularity of movement is obſerved. A time is the ſtated proportion of a lengthened tone, or of a reſt of equal duration. "I ſpeak of a reſt," ſays he, "as meaſured by time, becauſe otherwiſe the performers of two different parts, one of which ſhould have a reſt, and the other not, would be unable to proceed together in exact time. This ſeems to be the purport of the original, which however we ſhall conſtantly throw into the notes for the conſideration of the curious and learned reader who may perhaps diſcover meanings which may have eſcaped our penetration. Indeed, this paſſage gives an idea of more than ſimple counterpoint, of note for note, and ſyllable for ſyllable, being practiſed in Franco's time, who is believed to have written his tract within fifty years of Guido.

"Meaſured muſic," continues he, "is of two kinds: wholly, and partly meaſured. Muſic wholly meaſured is diſcant, which is meaſured throughout; and that which is partly meaſured is the ſimple chant or plain-ſong, which, though meaſured by time in ſome degree, is neither organum nor diſcant, as it is commonly called by thoſe who ſing the eccleſiaſtical chants." "Dividitur autem menſurabilis muſica in menſurabilem ſimpliciter et partim. Menſurabilis ſimpliciter eſt diſcantus, eo quod in omni parte ſua menſuratur. Menſurabilis partim eſt cantus ſimplex et tempore menſuratus, ſed organum non eſt, neque diſcantus, (organum) communiter vero dicitur quibus cantus eccleſiaſticus tempore menſuratur."

It ſeems, by this paſſage, as if organizing, or ſinging in harmony, had firſt brought the *plain-chant* to *ſtrict time*; and that, then, when only a *ſingle* part or melody was ſung *in time*, it was cuſtomary to call it *organum*, becauſe *meaſured like* the *organum*. And perhaps, in ſinging upon a plain-ſong, the principal melody, while it continued to be chanted nearly in the ſame manner as it uſed to be before parts were added to it, was ſaid to be *partly meaſured*; and the organum or diſcant, moving in proportionate notes of different lengths, was regarded as *wholly meaſured*. In our cathedrals, where the pſalms are chanted in four parts, time is neither abſolutely kept, nor wholly diſregarded: it is kept with reſpect to the harmony, as all the parts move together; yet the melody of each part, being governed by the length of the verſes, cannot be ſaid to be regularly meaſured. In accompanied recitation the inſtruments move ſometimes *à tempo*, while the voice part ſeems *ad libitum*. He next defines *diſcant*, and, as the reader, curious in muſical hiſtory, may wiſh to know the acceptation of this term ſo near the time of its invention, we refer to the article DISCANT. He likewiſe defines *mood*, which ſee in its proper place. In his ſecond chapter, Franco treats of ſimple notes or characters, of which he enumerates only three kinds, the long, the breve, and ſemi-breve; (making no mention of the *large*, or the *minim.*) Theſe, he tells us, are either perfect or imperfect. The perfect long he calls the firſt and principal of all the notes, for in that all others are included. "The perfect note, he tells us, is that which is meaſured by three times, or portions; the ternary diviſion being the moſt perfect of all, as it had its name from the Holy Trinity, which is true and pure perfection."

The perfect long is repreſented by a ſquare, not with a tail on the right hand, deſcending, as thus: 

This is equal to three breves. The imperfect long, repreſented by the ſame figure, is equal only to two. It is imperfect for the reaſon already aſſigned, ſays Franco, and can only acquire its full length by the addition of a breve before or after it. "Whence it follows," continues he, "that thoſe err who call it perfect; as that only is entire and complete which can ſtand by itſelf."

It ſeems by this paſſage as if there had been a controverſy even in Franco's time about the greater degree of perfection of triple, or common time; in after ages, however, the binary

binary number acquired the pre-eminence, and was called perfect, while the triple proportion was degraded into imperfect. The length of the notes, that is, the perfection or imperfection, triple or double powers, depended on their *position.* But to conclude this subject we plunge the reader into a sea of trouble concerning distinctions about which our forefathers themselves were not well agreed: and the rules of Franco on this subject are too numerous, complex, and useless to merit the reader's attention, or an attempt at explaining them. Indeed if they would help to decipher other music composed after the time of Franco, the curious enquirer's trouble and our own might be repaid, but there was at first so much confusion in the moods, and so many and so dark were the exceptions to their rules, so numerous and jarring the opinions and decisions concerning them, and so little agreed were musicians about the different prolations, points of perfection and imperfection, of increase and diminution, division and translation, even in Morley's time, as gave occasion to his saying, that "no two of them told the same tale."

Franco, Nicholas, born at Benevento in 1510, was son of a schoolmaster, under whom he acquired a knowledge of the learned languages. In his youth he became acquainted with Peter Aretino, from whom he caught that spirit of satire which made him so many enemies, and which drove him from his own country to Venice, where Aretino then was. Their union was neither sincere nor long lived. The success of Aretino's letters excited the envy of Franco, who published, by way of rivalry, his "Pistole Vulgari" in 1539. A fierce war was commenced between them, and sustained on each side with the greatest rancour and malignity. Franco left Venice and took up his abode at Montferrat, where he published a dialogue, entitled "Delle Belleze:" also a collection of sonnets against Aretino with a "Priapeia Italiana," which contained the grossest obscenity, the most unqualified abuse, and the boldest satire against princes, popes, the fathers of the council of Trent, and other eminent persons. The licentiousness of Franco did not injure his literary reputation; he was a principal member of the academy of Argonauti at Montferrat, and in this capacity wrote his "Rime Maritime," printed at Mantua in 1549. At Mantua he followed the profession of a schoolmaster, thence he removed to Rome, where he published commentaries on the "Priapeia," attributed to Virgil, the copies of which were suppressed and burned by order of pope Paul IV. Under Pius IV. he continued to indulge his virulence, but was preserved from personal chastisement by the protection of cardinal Morone. His imprudence however, in writing a Latin epigram against Pius V., with other defamatory libels, brought upon him that punishment, which it seems extraordinary he should so long have escaped. He was taken from his study in his furred robe, and hanged on the common gallows without trial or ceremony, which may and ought to prove a warning against the faults, the indiscretions, and the vices to which talents, without principle and morality, are liable. He was author of several other works besides those already enumerated, and he left behind him in MS. a translation of Homer's Iliad. An attempt has been made, in the "Annee Litteraire," to raise Franco to the dignity of a reformer of the corruptions of the age, on account of which he was singled out as a martyr to his heroism: but his writings will not justify the supposition. Moreri.

FRANCOA, in *Botany*, named by the late abbé Cavanilles, in honour of Francis Franco, a physician and botanist of Valentia, who lived about the middle of the 16th century, and taught physic at Alcala, Seville, and Coimbra. Cavan. Ic. v. 6. 76. Class and order, *Octandria Tetragynia.* Nat. Ord. uncertain.

Gen. Ch. *Cal.* Perianth inferior, permanent, in four deep, equal, lanceolate divisions. *Cor.* Petals four, ovate-oblong, equal, narrow at the base. *Stam.* Filaments eight, awl-shaped, equal, shorter than the corolla, inserted into the receptacle close to the germen, accompanied by eight intermediate alternate glands between their bases; anthers ovate, erect, of two cells. *Pist.* Germen superior, sessile, ovate, with four deep furrows; styles none; stigmas four, short, ovate, flat, spreading. *Peric.* Capsule with four angles, and four deep intermediate furrows, of four cells and eight valves; or rather consisting of four bivalve capsules, compressed, and cohering by their inner margins. *Seeds* minute, numerous, oblong, rugged, ranged along the inner edge of the valves.

Eff. Ch. Calyx of four leaves. Petals four. Eight glands alternate with the stamens. Capsules four, bivalve, cohering by their inner edge. Seeds numerous.

1. F. *appendiculata.* Cav. Ic. v. 6. 77. t. 596.—Leaves lyrate, with distant lobes. Calyx and flower-stalks hairy.—Discovered by Louis Née in the fertile island of San Carlos de Chiloe, and other parts of Chili, flowering in February. *Root* spindle-shaped, perennial? *Stem* none. *Leaves* radical, deeply lyrate, wavy, crenate, downy, a span long. *Flower-stalk* solitary, taller than the leaves, round, hairy, naked, simple or divided, racemose. *Flowers* leaning to one side, the size of Borage, of a pale rose-colour, their calyx, stalks, and bracteas at the base of each partial stalk, villose. Sometimes the flowers are over luxuriant, or monstrous. Each petal is marked with a deep-coloured spot.

2. F. *sonchifolia.* Cav. Ic. v. 6. 77. (Llanpankè; Feuillée Plant. Med. 742. t. 31.)—Leaves lyrate, with imbricated lobes. Calyx and flower-stalks smooth.—Gathered by Feuillée on the mountains of Chili, latitude 36° 57′ south. This much resembles the former, but the lobes of the *leaves* are represented as crowded and imbricated, and the *flowers'* more numerous, crimson, with a violet spot on each petal. The juice of the plant appears by Feuillée's account to be of an astringent quality, being used as an application to stop blood, and by the dyers to dye black.

Concerning the natural order of this genus, known to us only by the works of Cavanilles and Feuillée, we have no certain ideas. It seems allied to *Drosera*, whose affinity is itself obscure.

FRANCOCCI, in *Geography*, a town of the duchy of Spoleto; seven miles W.N.W. of Spoleto.

FRANCŒUR, Francis, in *Biography*, superintendant of the king of France's band of music, born in 1698, was a professor much respected by his countrymen. He connected himself in his earliest youth with M. Rebel, another respectable professor, in so close a friendship, that, like our Beaumont and Fletcher, they constantly ran the same course. Their intimacy was so perfect, that it was never known which was the author of the several pieces of their composition. In their early youth they played so agreeably on the violin, that they were only known by the title of the "little fiddlers." M. Francœur was admitted into the opera band in 1710, and soon after was appointed one of the king's chamber musicians.

In 1724 he purchased the place of one of the twenty-four musicians of the king's band on the establishment, as well as the survivorship of composer to his majesty, to which he arrived in 1733. In 1736 Messrs. Rebel and Francœur were nominated inspectors of the opera. In 1742 the latter purchased of M. Blamont the reversion of the place of superintendant or master

master of the king's band, to which he succeeded in 1760. At length he became director and manager of the opera jointly with his friend Rebel, in 1757 to 1767, and was honoured with the order of St. Michael in 1764; and at the termination of this enterprize, the chevalier Francœur quitted all professional concerns, and lived only for himself and his friends. At nearly 80 years of age he had the courage to be cut for the stone, and to sustain that terrible operation, one of the longest and most difficult that ever was undertaken, it having been commenced three successive days. His fortitude, and the cheerfulness of his character, supported him under such dreadful circumstances, and in a few days he was perfectly recovered. Poor Dr. Worgan, in our own country, sunk under similar sufferings. M. Francœur published in his youth two sets of sonatas composed by himself alone; and in partnership afterwards with M. Rebel, eight operas, which abound with melody and excellent recitative, and had no other defect than the being sung too slow. Laborde.

Francœur, nephew of the preceding musician, losing his father during infancy, was adopted and educated by his uncle, and treated by him with all the care and tenderness of a father, and by his interest, and his own diligence and musical talents, he succeeded to most of the appointments of his uncle. He was likewise a composer of operas, and leader of the opera band. By his probity, and the simplicity of his character, he had the honour of being distinguished by the title of "honest Francœur" (Francœur l'honete homme.) He was author of a very useful tract to young musical composers, under the title of "Diapason de tous les instrumens à vent," scale and compass of all wind instruments, 1772.

FRANÇOIS, in *Geography*, a town of Canada, on the east coast of lake St. Pierre. N. lat. 46° 5'. W. long. 72° 36'.

François, *Cape*. See Guarico.—Also, the northernmost point of Kerguelen's land.

François, *Old Cape*, a town and cape on the north coast of the island of Hispaniola. N. lat. 19° 40'. W. long. 70° 44'.

François, *Port des*. See Français.

François *River*, a river of Upper Canada, which runs S.W. from lake Nipissing into lake Huron; it has several portages: that nearest to lake Nipissing is called Portage de Trois Chaudiers, about half a mile in length.

FRANÇOISE, a small island in the Atlantic, near the coast of Africa. N. lat. 20° 15'.

Françoise, *La*. See Françaisе.

FRANCOLI, a river of Spain, which runs into the sea near Tarragon, in Catalonia.

FRANCOLIN, in *Ornithology*, a species of *Tetrao*, which see.

FRANCOLINO, in *Geography*, a town of Italy, in the department of the Lower Po; eight miles N.E. of Ferrara.

FRANCONIA, a circle of Germany, bounded on the N. by Meissen and Thuringia, on the E. by Bohemia and the Upper Palatinate, on the S. by Bavaria and Swabia, and on the W. by the Lower Palatinate and the electorate of Mentz. The form of Franconia is somewhat circular, its diameter being about 150 miles; the land towards the centre is fertile in corn, wine, fruit, &c. but the frontiers are full of forests and mountains, and little cultivated. The chief river is the Mayne. The inhabitants of many towns are Roman Catholics, but the principal part consists of Lutherans. The Calvinists have some churches, and the Jews some synagogues. The states composing this circle are partly ecclesiastical and partly civil. See Germany.

Franconia, a township of America, in Grafton county, New Hampshire, 14 miles N.E. of Haverhill on Connecticut river. It was incorporated in 1764, and first called Morristown. It contains 129 inhabitants.

FRANCOSO, a town of Portugal, in the province of Beira; 22 miles E. of Viseu.

FRANCUCCI, Innocenzio, in *Biography*, an historical painter, born at Imola, and therefore known by the name of Innocenzio da Imola. He was one of the establishers of the Bolognese school. He became a disciple of Francesco Francia in 1506; then passed some time with Albertinelli at Florence; and from the evidence of his works, and the testimony of Vasari, studied much after Fra. Bartolomeo and Andrea del Sarto: for though the main disposition of his altar pieces be still Gothic, he no longer used the ancient gilding; he placed the Virgin on high in the centre, and surrounded her with saints and angels, architecture, and back grounds skilfully grouped and arranged with novelty and taste. Such is his style in the surprizing picture of the Duomo at Faenza, and in another at Pesaro. The aerial perspective and back ground remind us of Leonardo da Vinci. He sometimes placed smaller pictures under his altar pieces, like that at St. Giacomo of Bologna, which breathes the very spirit of Raffaello; that spirit he seems indeed to have aimed at in the greater part of his works, and to have approached it nearer than most of Raffaello's own scholars. He excelled Francia and his fellow scholar Bagnaeavallo in erudition, majesty, and correctness. Subjects of novel combination and fiery fancy he has not produced; nor seem they to have been congenial with that mildness and tranquillity of character which history ascribes to him. Fuseli's Pilkington.

FRANEKER, in *Geography*, a town of Holland, in Friesland; watered by two canals, navigable for barges, and having a castle, built in the 15th century, and a celebrated university, established by the states and William Louis comte of Nassau, in the year 1585. This is one of the neatest towns in Friesland, and has commonly been the residence of the noblesse of the country. The mean temperature of this town, during five years, was 52° 6'. The greatest usual cold is 12°, and the greatest heat 82°. The standard temperature of its latitude is 50° 2', the difference being 2° 4': the reason of which, according to Kirwan, is, that all continents, if flat, are in summer much warmer than the standard, and particularly those which border on the German sea, as that sea is, upon an average of the whole year, two degrees warmer than the Atlantic; but in winter the German sea is colder than the standard, and Holland, in general, is much exposed to N.E. Siberian winds. N. lat. 53°. E. long. 5° 42'.

FRANGIPANE, an exquisite kind of perfume, frequently given to the leather whereof gloves, purses, bags, &c. are made.

It takes its name from a Roman nobleman, of the ancient family of Fragipani, who was the inventor of it.

There is also a kind of perfumed liquor of the same denomination, said to have been invented by a grandson of Mutio Frangipani; and also a perfumed kind of *ros solis*, called by the same name.

FRANGULA, in *Botany*, so called from *frango*, to break, on account of the brittleness of its branches; the berry-bearing alder, *Rhamnus Frangula*; Engl. Bot. t. 250. (See Rhamnus.) The berries are often sold mixed with those of buckthorn, R. *catharticus*, with which they nearly agree in quality. If it be any object to distinguish them,

those of the *Frangula* may be known, as remarked in Lewis's Dispensatory, by having two seeds only, instead of four.

FRANGY, in *Geography*, a town of France, in the department of Geneva, and chief place of a canton in the district of Leman. The place contains 814, and the canton 7,535 inhabitants, on a territory of 175 kiliometres, in 24 communes.

FRANI, a town of Italy, in the department of the Adda and Oglio; two miles S.W. of Breno.

FRANK, or FRANC, a term literally signifying free and open, or exempt from public impositions and charges; as frank confession, frank fair, frank letter, &c.

The term frank is much used in our ancient customs and tenures, where it receives various particular modifications and meanings, according to the words it is combined with, as

FRANK *Allen*, or *allodium*, is a land, tenement, or demesne, that is not held of any superior lord.

FRANK *Almoign*, or *free alms*, is a tenure of lands or tenements bestowed on God; that is, given to such people as devote themselves to the service of God, in pure and perpetual alms; or, it is a tenure, whereby a religious corporation, aggregate or sole, holdeth lands of the donor, to them and their successors for ever.

Whence the feoffors or givers cannot demand any terrestrial service, so long as the land remains in the hands of the feoffees.

The service which the feoffees were bound to render for these lands is not certainly defined; but only in general, to pray for the souls of the donor and his heirs, dead or alive; and, therefore, they do no fealty, which is incident to all other services but this, because this divine service was of a more exalted nature. (Litt. § 131. 133. 135.) This is the tenure by which all the ancient monasteries and religious houses held their lands; and by which the parochial clergy, and many ecclesiastical and eleemosynary foundations hold them at this day. (Bracton, l. 4. tr. 1. c. 28. § 1.) This was an old Saxon tenure, and continued under the Norman revolution, on account of the respect shewn to religion and religious men in ancient times; and for this reason, tenants in frank-almoign were discharged of all other services, except the *trinoda necessitas*, of repairing the highways, building castles, and repelling invasions. (Seld. 1. 42.) And this tenure is still distinct from all others, being not in the least feodal, but merely spiritual; for, if the service be neglected, the law gives no remedy by distress or otherwise to the lord of whom the lands are holden; but merely a complaint to the ordinary or visitor to correct it. (Litt. § 136.)

Britton mentions another kind of land given in alms, but not free alms; the tenants being tied in certain services to the feoffor; as to sing so many masses, distribute such a sum in alms, and the like; and this tenure by divine service differs from the former, because for this, unperformed, the lord might distrain, without any complaint to the visitor. (Litt. § 137.) All such donations are now out of use; for since the statute of *quia emptores*, 18 Edw. I. none but the king can give lands to be holden by this tenure. (Litt. § 140.) These donations are expressly excepted, by name, in the stat. 12 Car. II. c. 24. abolishing tenures, and therefore subsist in many instances at the present day. See MORTMAIN.

FRANK *Bank*. See FREE *bench*.

FRANK *Chase* denotes liberty of free chase, in a circuit adjoining to a forest, on account of which men, though they have land of their own within that compass, are forbidden to cut down wood, without the view of the forester; though it be their own demesne. See CHASE.

FRANK *Fee*, *feudum francum*, as defined by Brook, is that which is in the hands of the king or lord of the manor; being ancient demesne of the crown.

FRANK *Fee*, *feudum liberum*, according to some, denotes that for which no service is performed to any lord.

According to Fachin, lib. vii. cap. 39. lands held in frank fee were exempted from all services, except homage; in contradistinction to that in the tenant's hands, which is only ancient demesne.

In the reg. of writs, frank fee is said to be that which a man holds at common law to him and his heirs; and not by such service as is required in ancient demesne, according to the custom of the manor.

It is added, that the lands in the hands of king Edward the Confessor, at the making of Domesday-book, were ancient demesne; and all the rest frank fee. On which footing, all the lands in the realm are either ancient demesne, or frank fee.

Others define frank fee to be a tenure in fee simple, or lands pleadable in common law; and not in ancient demesne. See DECEIT and FEE.

FRANK-*ferme*, *firma libera*, denotes lands or tenements, wherein the nature of the fee is changed by feoffment, from knight's service to a certain yearly service; and whence neither homage, wardship, marriage, nor relief, may be demanded, nor any other service not contained in the feoffment. See FEE-*farm* and SOCAGE.

FRANK-*fold* is where the lord hath the benefit of folding his tenant's sheep, within his manor, for the manuring of his land.

FRANK *Language*, or *lingua Franca*, is a kind of jargon, spoken on the Mediterranean, and particularly throughout the coasts and ports of the Levant, composed of Italian, Spanish, French, vulgar Greek, and other languages.

The lingua Franca is the trading language; and is thus called from the Franks, a common appellation given in the Levant to all the European merchants and traders who come thither to traffick.

In this language, if it may be so called, nothing but the infinitive mood of each verb is used; this serving for all the tenses and moods of the conjugation; and yet this lame, mutilated diction, this barbarous medley, is learnt and understood by the merchants and mariners of all nations who repair thither.

FRANK *Law*, *lex libera*, is the benefit of the free and common law of the land.

He that for any offence, as conspiracy, &c. loseth his frank law, incurs these inconveniencies: 1. That he may not be impanelled on any jury or assize; or otherwise used as an evidence or witness to the truth. 2. That if he have any thing to do in the king's courts, he must not approach them in person, but appoint his attorney. 3. That his lands, goods, and chattels, be seized into the king's hands; and the lands be estreated, his trees rooted up, and his body committed to custody.

FRANK *Letters*, or *letters free of postage*. The privilege of such letters was claimed by the house of commons in 1660, when the first legal settlement of the present post office was made; but afterwards dropped on a private assurance from the crown, that this privilege should be allowed the members. Accordingly, a warrant was constantly issued to the postmaster general, directing the allowance thereof to the extent of two ounces in weight; till at length it was expressly confirmed by stat. 4 Geo. III. cap. 24. which adds many new regulations, rendered necessary by the abuses crept into the practice

practice of franking; whereby the annual amount of franked letters had gradually increased from 23,600*l.* in 1715, to 170,700*l.* in 1763.

By other subsequent regulations it is required that franks should be dated, with the month, &c. written at length, and put into the office the same day. The following restrictions and orders are enjoined by 35 Geo. III. now in force; no letter, directed to or by any member of parliament, shall be exempted from postage, if it exceeds one ounce in weight. No letter directed by any member shall be exempted, unless he shall actually be in the post-town, or within the limits of its delivery of letters, or within twenty miles of such post-town, on the day, or on the day before the day, on which the letters shall be put into the office. No member shall be entitled to send free from postage more than ten letters in one day, nor to receive more than fifteen. Whenever the number of letters sent or received by such members in one day shall exceed the number exempted, the letters chargeable with a higher postage shall be included in the number exempted, in preference to any chargeable with a lower postage, and the remainder shall be chargeable with the postage to which common letters are subject. Persons who may now in right of their offices send and receive letters free, may continue so to do. Printed votes, or proceedings in parliament, and printed newspapers, may also be sent as usual.

No single letter sent by the post from any non-commissioned officer, seaman, or private, in the navy, army, militia, fencible regiments, artillery or marines, shall be charged with more postage than one penny; but the same must be paid at the time of putting the same into the post-office; and such letter must have written thereon, in the hand writing of, and signed by the commanding officer, the name of such commanding officer, and of the ship, vessel, corps, regiment, or detachment. Also no single letter directed to any such non-commissioned officer, seaman or private, shall be charged with more postage than one penny, to be paid on the delivery thereof; but such letter must be directed to such persons, specifying the ship, vessel, regiment, troop, corps, company or detachment to which they belong; and the post-master must deliver such letter either to the party to whom it shall be directed, or to some person appointed to receive the same by the commanding officer, and to no other.

Every cover containing patterns or samples of goods, not exceeding one ounce, shall be charged only as a single letter, if sent open at the sides, and without any letter or writing therewith, other than the name of the person sending the same, the place of his abode, and the prices of the articles. See Post-Office and Revenue.

Frank *Marriage*, *liberum maritagium*, is a tenure in tail special; whereby lands and tenements are held to a person and his wife, and the heirs of their bodies, on condition of doing fealty to the donor, till the fourth degree of consanguinity between the issues of the donor and donee.

Fleta gives this reason, why the heirs do no service till the fourth degree: "ne donatores, vel eorum hæredes, per homagii receptionem a reversione repellantur;" and why, in the fourth descent, they shall do service to the donor, "quia in quarto gradu vehementer presumitur quod terra est pro defectu hæredum donatorum reversura."

Frank marriage is expressed by Bracton, to be that where the donor intends that the land thus bestowed shall remain quiet, and free from all secular service that might be annexed to the fee; so that he who gave it shall claim no manner of service from it, until the third heir, and the fourth descent, or degree; reckoning the donee in the first degree, his heir in the second, the heir of him in the third, and his again in the fourth; but afterwards the same land to become subject to all the former services; as being then supposed to revert to the lord, for want of heirs.

The lands otherwise given in marriage, viz. *servitio obligatæ*, were with a reservation of the services due to the lord, which the donee and his heirs were bound to perform for ever: only homage was not to commence till the fourth degree, when both service and homage were to be enjoined for ever.

A gift of lands by one man to another with a wife in frank-marriage amounts by implication of law to a gift in tail; which in this case may be created without the words "heirs" or "body." (Litt. 17. Wood's Inst. 120.) A gift in free-marriage might be made as well after as before marriage; and such a gift was a fee-simple before the statute of Westm. 2.; but since, it is usually a fee-tail. Although this tenure is now grown out of use, it is still capable of subsisting in law. It is liable to no service but fealty.

Frank-*pledge* signifies a pledge or surety for the behaviour of a freeman; called also *friburgh*.

The ancient custom of England, for the preservation of the public peace, was, that every free-born man, at fourteen years of age (religious persons, clerks, knights, and their eldest sons, excepted) should find surety for his truth towards the king and his subjects, or else to be kept in prison.

Accordingly, a number of neighbours became interchangeably bound for each other, to see each man of their pledge forthcoming at all times; or to answer for the offence committed by any one gone away; so that whenever one offended, it was presently inquired in what pledge he was, and then those of that pledge either brought him forth within one and thirty days to his answer; or they satisfied for his offence.

This custom was called frank-pledge; and the circuit it extended to *decenna*, because it usually consisted of ten housholds; and every person thus bound for himself and neighbours was called a *decennier*. See Decennary, Deciners, and Tithing.

In observance of this custom, the sheriffs at every county-court did from time to time take the oaths of young persons, as they arrived at the age of fourteen; and see they were settled in one *decenna* or *dozein*, or another; whereupon this branch of the sheriff's office and authority was called *visus franci plegii*, i. e. *view of frank-pledge*. See Court-leet.

"Omnis homo, sive liber sive servus, aut est, vel debet esse, in franco plegio, aut de alicujus manupastu, nisi sit aliquis itinerans de loco in locum, qui non plus se teneat ad unum quam ad alium, vel qui habet quod sufficiat pro franco plegio, sicut dignitatem, vel ordinem, vel liberum tenementum, vel in civitate rem immobilem, &c." Bracton, lib. iii. Tract. de Corona, cap. 20.

At this day no man ordinarily gives any other security for the keeping of the peace, besides his own oath; so that no one answers for the transgression of another, but every person for himself. 4 Inst. 76.

Frank *Service*. See Service.

Frank *Tenement*. See Tenement, and Freehold.

Frank, or *Franc*, also denotes an ancient coin, struck, and current in France; thus called from its impression, which represented a Frenchman, sometimes on horseback, and sometimes on foot.

The frank was either of gold or silver: the first was worth somewhat more than the ecu d'or, or gold crown. See Crown.

The fecond was a third of the firft; but thefe coins have been long difufed.

The term frank, however, is ftill retained as the name of a money of account. In this fenfe it is equivalent to a livre, or twenty fols, or a third of a French crown. See EXCHANGE.

FRANKENAU, in *Geography*, a town of Germany, in the principality of Hohenlohe; 12 miles N. of Dinkelfbahl.—Alfo, a town of Germany, in the principality of Heffe; 24 miles S.W. of Caffel.

FRANKENBERG, an ancient town of Germany, in the circle of Erzgeburg, on the Tfchopa; fortified againft the Saxons by Charlemagne; 7 miles N.N.E. of Chemnitz. N. lat. 50° 50'. E. long. 12° 59'.

FRANKENDAL, or FRANKENTHAL, a town of France, in the department of Mont Tonnerre, and chief place of a canton, in the diftrict of Spire, fituated on a fertile plain, on a navigable canal which communicates with the Rhine. It originated with two convents, one for men and the other for women; and by the acceffion of fome Flemings, who, flying from perfecution, fettled here, it became a flourifhing town: but it felt the miferies of war in common with the reft of the Palatinate in the 17th century, but was afterwards rebuilt in a regular and handfome manner. The inhabitants are engaged in manufactures of porcelain, cloth, ferges, filk, ftuffs, ftockings, foap, &c. In 1793 it was taken by the French. It contains three churches and an hofpital. In the town are reckoned 3,235, and in the canton 11,381 inhabitants, in 17 communes; 8 miles S. of Worms.

FRANKENFELS, a town of Auftria, feated on the river Noderspach; 36 miles W. of Vienna.

FRANKENHAUSEN, a town of Germany, in the principality of Schwartzburg-Rudolftadt, divided into the old and new town, fituated on a branch of the Wipper. It contains three churches, and a fchool, which was formerly a Ciftercian convent; with profitable falt-works, belonging to the citizens; 26 miles N. of Erfurt. N. lat. 51° 16'. E. long. 11° 10'.—Alfo, a town of Germany, in the circle of Erzgeburg; 8 miles N.N.W of Zwichau.

FRANKENHEIM, a town of Germany, in the county of Henneberg; 14 miles W. of Meinungen.

FRANKENIA, in *Botany*, fo named by Linnæus in memory of his predeceffor John Franck, or Franckenius, profeffor of botany and anatomy at Upfal, who died in 1661, at the age of 71. He publifhed a catalogue of plants with Latin and Swedifh names, under the title of "Speculum Botanicum," which went through two editions, and is now equally rare and ufelefs. We have alfo an inaugural differtation under his prefidency in 1633, by Hernodius, on the virtues of Tobacco, which are therein highly extolled, and a fmall German work on the Materia Medica, printed at Roftock in 1619, in quarto. This fame genus was originally called *Franca* by Micheli, after Dr. John Sebaftian Franchi, of Lucca, who practifed phyfic with great reputation at Florence, and was one of the founders of the Botanical Society of that place. If what Micheli fays of him be true, which no one can doubt, he deferved commemoration as much as Frankenius, whofe laurels have thus been grafted on his ftock.—Linn. Gen. 176. Schreb. 234. Willd. Sp. Pl. v. 2. 241. Sm. Fl. Brit. 387. Mart. Mill. Dict. v. 2. Juff. 303. (Franca; Mich. Gen. 23. t. 22. Nothria; Berg. Cap. 171.)—Clafs and order, *Hexandria Monogynia*. Nat. Ord. *Caryophylleæ*, Juff.

Gen. Ch. *Cal.* Perianth inferior, of one leaf, funnel-fhaped, fomewhat cylindrical, ten-fided, permanent, with five, rarely four, fharp fpreading teeth at the orifice. *Cor.* Petals five, rarely four, their claws the length of the calyx; limb flat, roundifh, fpreading. Nectary? a linear, channelled, pointed, parallel fcale, inferted into the claw of each petal. *Stam.* Filaments fix, the length of the calyx; anthers roundifh, two-lobed. *Pift.* Germen oblong, fuperior; ftyle fimple, the length of the ftamens; ftigmas three, oblong, erect, obtufe. *Peric.* Capfule oval, of one cell and three valves. *Seeds* numerous, ovate, minute.

Eff. Ch. Calyx five-cleft, funnel-fhaped. Petals four or five, with a fcale upon each claw. Stigmas three. Capfule fuperior, of one cell and three valves.

1. F. *lævis.* Smooth Sea-Heath. Linn. Sp. Pl. 473. Engl. Bot. t. 205. (Franca maritima fupina faxatilis glauca ericoides fempervirens, flore purpureo; Mich. Gen. 23. t. 22. f. 1.)—Leaves linear, clustered, ciliated at the bafe. Stem nearly fmooth.—Found on the fea coafts of the fouthern parts of Europe in a muddy foil, flowering in July. The *root* is perennial and woody. *Stems* procumbent, branched, forked, leafy, round, perennial, fmooth or nearly fo, except the young branches, which are downy. *Leaves* clustered, on fhort ftalks, oblong, revolute, pointed, glaucous, fmooth; fringed at the bafe. *Flowers* folitary, feffile, either in the forks of the ftem or at the ends of the branches. They refemble thofe of a *Lychnis* in miniature, and are ufually pink; Micheli fays they are fometimes white.

F. *Nothria.* Thunb. Prod. 58. Willd. Sp. Pl. v. 2. 242. (Nothria repens; Berg. Cap. 171. t. 1. f. 2.); is certainly the fame plant, and not even a variety, though a native of the Cape of Good Hope. The character of the fharp petals, given by Willdenow, is merely taken from Bergius's figure, which is faulty. He himfelf defcribes them rounded and obtufe, as we find them in a Cape fpecimen. Neither Bergius nor Thunberg feems to have known any thing of *Frankenia lævis*, or the latter would fcarcely have made of it a new fpecies, nor the former a new genus.

2. F. *hirfuta.* Hairy Sea-Heath. Linn. Sp. Pl. 473. Sm. Prodr. Fl. Græc. Sibth. v. 1. 243. (Franca maritima fupina multiflora candida, caulibus hirfutis, foliis quafi vermiculatis; Mich. Gen. 23. t. 22. f. 2.)—Leaves linear, clustered, ciliated at the bafe. Stem hairy.—Native of the fea-coafts of Italy, Barbary, Greece and the Archipelago, in moift places, flowering in July. We can fcarcely think this more than a hairy and rather luxuriant variety of the former. The character of the flowers growing in terminal clufters, taken by Linnæus from Micheli's plate, does by no means hold good, though the abundance of bloom on luxuriant fpecimens gives them that appearance. They are produced from the forks of the *ftem*, as well as from the ends of the branches, and it is only when thofe branches are fhort, and frequently forked, that the *flowers* acquire a clustered afpect. The *leaves* feem to become more glaucous in proportion as the plant is more luxuriant.

Thefe are pretty plants, but extremely difficult of culture. The *Arenaria rubra*, fo common on our fandy heaths and fea fhores, is no mean imitation of them.

3. F. *microphylla.* Small-leaved Sea-Heath. Cav. Ic. v. 6. 77. t. 597. f. 1.—Leaves elliptical, revolute, fmooth, imbricated in four rows. Stem fmooth. Petals crenate.—Gathered by Louis Née at Port Defire in South America, flowering in December. The *ftems* are fhrubby, much branched, decumbent, fcarcely fix inches long, fmooth like every other part of the plant. *Leaves* oppofite, united at the bafe, imbricated in four rows, fmall, elliptical, entire, revolute, naked, concave underneath. *Flowers* terminal, folitary, feffile, erect, whitifh; the petals dilated and crenate at the extremity.

We know this only by Cavanilles' defcription and figure, which

which leave no doubt of its being distinct from both the preceding, of which its smooth naked imbricated leaves afford a decisive mark.

4. F. *tetrapetala.* Four-petalled Sea-Heath. Billard. Nov. Holl. v. 1. 88. t. 114.—Leaves awl-shaped, fleshy, dotted, smooth, opposite, spurred at the base. Petals four, obtuse.—Gathered by Billardiere in Van Diemen's land. The *stems* are shrubby, prostrate, apparently smooth, longer than the last, throwing up numerous short, erect, simple or divided, leafy branches. *Leaves* opposite, somewhat imbricated, dotted with glandular pores, awl-shaped, with a longitudinal furrow on the upper side. *Flowers* terminal, solitary, sessile. Segments of the *calyx* deep, downy at the edge, four only in number as well as the *petals*. The *stamens* and *pistils* however are each of the number proper to the genus. Nothing is said of the colour of the flowers, for though M. La Billardiere gathered them fresh, it appears from this and other instances, that his descriptions and figures were generally made from the dried specimens after his return to Europe. Their accuracy therefore confers the more honour on their author.

5. F. *pulverulenta.* Powdery Sea-Heath. Linn. Sp. Pl. 474. Sm. Fl. Brit. 388. Hudf. 138. Sm. Prodr. Fl. Græc. Sibth. v. 1. 243. (Franca maritima quadrifolia annua supina, chamæsyces folio et facie, flore ex albo purpurascente; Mich. Gen. 23. Alsine maritima supina, foliis chamæsyces; Dill. in Raii Syn. 352. Quadrifoglio annuo, piante di Persia; Zannon. Ist. 164. t. 66.)—Leaves obovate, abrupt, downy and powdery beneath.—Native of sea-shores throughout the south and east of Europe, flowering in July. Dillenius and Hudson report that it grows in Sussex, but we have never seen an English specimen. The *root* is annual. *Stems* numerous, prostrate, repeatedly forked and divaricated, nearly smooth, except the opposite sides of the young branches. *Leaves* opposite, two pair at every joint, nearly sessile, obovate, entire, very obtuse, somewhat revolute, smooth and green above, downy and rather powdery beneath. *Flowers* axillary and terminal, pale purple, with rounded crenate petals.—Micheli erroneously makes two species of this, supposing Zannoni's plant different from his own.

It is observable in this genus that the number of the stamens, six, bears an analogy to the three stigmas and three valves of the capsule, and not to the petals, nectaries, or segments of the calyx, which are each usually five. This is a rare instance in nature, but not unique in the natural order to which it belongs, several of the genera of which have three stamens in a five-cleft flower.

FRANKENSTEIN, in *Geography*, a town of Silesia, in the principality of Munsterburg, on the river Bautze; 12 miles S.S.W. of Glatz. N. lat. 51° 25′. E. long. 16° 42′.—Also, a town of Germany, in the circle of the Upper Rhine; 5 miles S.E. of Darmstadt.—Also, a town of France, in the department of Mont-Tonnerre; 20 miles S.E. of Deux Ponts.

FRANKENWINHEIM, a town of Germany, in the principality of Wurzburg; 4 miles S.W. of Geroltzhofen.

FRANKERAU, a town of Prussia, in the province of Ermeland; 10 miles S. of Heilsberg.

FRANKFORT. See FRANCFORT.

FRANKFORT, a post-town of America, in Hancock county, and state of Maine, on the W. side of Penobscot bay, 8 miles W. of Penobscot; containing 867 inhabitants.

FRANKFORT, or *Frankford*, a pleasant thriving village of America, in the county of Philadelphia and state of Pennsylvania, on the N.E. side of a creek of the same name, 1½ mile from Delaware river, containing 100 houses, an episcopal, and a German church; about 5 miles N.E. of Philadelphia.—Also, a new township in Herkemer county, New York, E. of Whitestown; containing 946 inhabitants.—Also, a thriving village in Hampshire county, Virginia, seated on a creek which empties itself into Potowmack river; 13 miles N.W. of Rumney.—Also, the capital of Pendleton county, Virginia, situated on the W. side of Potowmack river, containing a court-house, gaol, and about thirty houses; 180 miles N.W. of Richmond.—Also, a post-town, and the metropolis of Kentucky, situated in Franklin county, on the N.E. bank of Kentucky river, about 50 miles from its confluence with the Ohio. It is a flourishing town, regularly laid out, and has a number of good houses. The state-house is a handsome building. It contains 628 inhabitants. N. lat. 38° 14′. W. long. 95° 28′.

FRANKINCENSE, or simply *Incense*, an odoriferous aromatic gum, or resin, anciently burnt in temples, as a perfume, and now used in pharmacy, as an agglutinant and strengthener.

The word is formed from the Latin *incensum, burnt;* as alluding to its ancient use in temples.

Frankincense distils from incisions made in a tree called *arbor thurifera*, during the heats of summer. But notwithstanding the great use of this gum, both in the ancient religion, and the modern medicine, the tree that produces it, or even the place where the tree grows, has been but little known.

The most common opinion has always been, that it was brought from Arabia Felix, and was found near the city of Saba; whence its epithet *Sabæum;* and yet the name *olibanum*, which it sometimes also bears, seems to intimate, that there are of these thuriferous or incense-bearing trees in the Holy-land, near mount Lebanon. And travellers are positive that there are others in the East Indies.

Nor are we less at a loss as to the form or kind of the tree from which it flows. Pliny contents himself to say, that it at first resembles the pear-tree; then the mastich-tree; then the laurel; but that in reality it is a kind of turpentine-tree. This gummy resinous substance is said to ooze spontaneously from the bark of the *Juniperus lycia*, appearing in drops or tears, of a pale yellowish, and sometimes of a reddish colour.

Frankincense is usually divided into male and female.

The best *male incense, thus masculum*, called also *olibanum*, (which see,) is in fair white bits or tears, a little yellowish, of a bitter disagreeable taste; and when chewed it promotes the flux of saliva, which becomes white. When laid on coals, or a red-hot iron, it flames and burns with a strong and not unpleasant smell. On trituration with water, the greatest part dissolves into a milky liquor, which deposits a resinous matter, and, being gently inspissated, leaves a yellow extract, retaining the greatest part of the smell as well as taste of the olibanum. Rectified spirit dissolves less than water; nevertheless it extracts nearly all its active matter.

This drug has received different appellations according to its different appearances: the single tears are called simply *olibanum*, or *thus;* when two are joined together, *thus masculum;* and when two are very large, *thus femininum;* if several adhere to the bark, *thus corticosum:* the fine powder which rubs off from the tears is denominated *mica thuris;* and the coarser *manna thuris.*

That brought from the Indies is not near so good as that from Arabia or mount Lebanon; it is sometimes called incense of Mocha; though it be not brought from that city.

It is often in a mafs, but fometimes in loofe drops or tears; fomewhat reddifh, and bitter to the tafte. Some fell this for the true bdellium.

Male incenfe, or *olibanum*, was formerly an ingredient in divers Galenical and chemical preparations: and was ufed, not only in divers difeafes of the head and breaft, but in vomitings, diarrhœas, and dyfenteries. The dofe was from a fcruple to a dram or more. Externally, it was applied to ftrengthen the brain, and heal wounds. Some ufed it to affuage the tooth-ach; but it is apt to fpoil the good teeth. Riverius found it of great efficacy in pleurifies, which were faid to be epidemic; and Geoffroy likewife experienced its fuccefs in thefe difeafes, efpecially after venefection. At prefent, however, recourfe is feldom had to this medicine, which is now fuperfeded by myrrh, and other articles of a lefs ftimulating kind.

As for female incenfe, or frankincenfe, authors defcribe it to be fofter, and more refinous, but of leffer virtue than the former. This common frankincenfe is brought to us in little globes or maffes, of a brownifh or yellowifh colour on the outfide, internally whitifh, and variegated with whitifh fpecks. This refin has a bitterifh, acid, unpleafant tafte, and no confiderable fmell; it diffolves totally in rectified fpirit, but is fcarcely acted upon by watery menftrua. It may be looked upon as a mild corroborant; though at prefent it is little otherwife made ufe of than as an ingredient in theriaca, and externally in plafters. Lewis, Mat. Med.

Bark of incenfe, *cortex thuris*, is the bark of the tree whence the incenfe flows, which has the fame qualities with the incenfe itfelf.

There is another bark brought from the Indies, called alfo bark of incenfe, and fometimes Jews' incenfe, becaufe the Jews make frequent ufe thereof in their perfume: this is the *cortex eleutheriæ*.

Manna of incenfe is the flour, or farina of incenfe, occafioned by the friction of the grains againft each other in the facks wherein they carry it.

There is alfo a fort of incenfe, which is a preparation of it, burnt like refin to make lamp-black.

Frankincenfe was formerly burnt in the temples of all religions, to do honour to the divinities that were there adored. Many of the primitive Chriftians were put to death, becaufe they would not offer incenfe to idols.

In the Romifh church they ftill retain the ufe of incenfe in fome of their ceremonies; always at high-mafs, and at the elevation of the hoft at vefpers; and at folemn funerals, beftowing it on fuch perfons as they would honour, as on prelates, &c. and fometimes alfo on the people.

FRANKLAND'S Islands, in *Geography*, a clufter of fmall iflands on the N.E. coaft of New Holland, in the South Pacific ocean, about two leagues diftant from the main land. S. lat. 17° 12'. E. long. 146°.

FRANKLANDIA, in *Botany*, fo named by Mr. Robert Brown, in his valuable paper on the natural order of *Proteaceæ*, in honour of the prefent fir Thomas Frankland, bart. F.R.S. and F.L.S., an excellent Englifh botanift, whofe obfervations, illuftrated by microfcopic drawings of his own, relating to fubmarine plants, it is hoped may one day be communicated by himfelf to the public. This genus is happily chofen for the purpofe, on account of the fucus-like appearance of the leaves.—Brown Tranf. of Linn. Soc. v. 10. 157. Clafs and order, *Tetrandria Monogynia*. Nat. Ord. *Proteaceæ*.

Gen. Ch. *Cal.* none, except the corolla be taken for fuch. *Cor.* of one petal, falver-fhaped, inferior; tube permanent, at length indurated; limb in four deep fegments, fpreading, flat, equal, deciduous. Nectary four glands at the bafe of the germen, united into a tube. *Stam.* Filaments four, adhering through their whole length to the tube of the corolla; anthers oblong, included in the tube; pollen fpherical. *Pift.* Germen fuperior, ftalked; ftyle fimple, the length of the tube; ftigma . . . *Peric.* Nut fpindle-fhaped, ftalked, dilated at the top, and crowned with longifh down. Cotyledons very fhort.

Eff. Ch. Corolla falver-fhaped; limb in four deep, flat, deciduous fegments; tube permanent. Anthers included, adhering to the tube. Nectariferous glands united into a cylinder. Nut fpindle-fhaped, ftalked, crowned with long down.

1. F. *fucifolia.* Native of Lewins' land, on the fouth coaft of New Holland, in moift heaths. *Mr. Brown.* A fmooth *fhrub.* Leaves alternate, thread-fhaped, dichotomous. *Spikes* axillary, fimple. *Flowers* alternate, of a dull yellow, each accompanied by one *bractea.*

FRANKLIN, Benjamin, in *Biography*, was born at Bofton, in New England, in 1706; but he fprung from a Northamptonfhire family, who had, for many generations, poffeffed fome freehold property at Eaton in that county. It was on account of the perfecutions carried on in the reign of Charles II. againft the Nonconformifts, that the father of Benjamin left England for America, where he carried on the trade of a tallow chandler. In that occupation the fubject of this article was employed in early life; but it was ill adapted to his difpofition, and he felt unwilling to continue pulling cottons, filling moulds, and other employment to which his youth was equal, and was anxious to embark in a fea-faring life. This was oppofed by his father, who took every care to infpire in his fon the principles of morality; and in his fcanty library Benjamin found books which he read with avidity; but Defoe's "Effay on Projects" was the work which gave him moft delight, and which left on his mind impreffions that influenced the principal events of his life. His inclination for books determined his father to place him as apprentice to an elder brother, a printer at Bofton. He was accordingly bound to him in the year 1717, when he was fcarcely twelve years of age. He foon became a proficient in the mechanical part of the bufinefs, and feized every opportunity for reading books that he could borrow from his acquaintance; in which amufement he fpent the greater part of his nights. He foon began to indulge himfelf in writing ballads and other poetical pieces; but it is faid his father fpeedily fatisfied him that this was not the fpecies of compofition in which he could excel, and his next efforts were directed to profe compofition, in which his fuccefs is well known and duly appreciated. With a paffion for reading and writing he imbibed a kindred one for difputation, and adopting the Socratic method, he became dextrous in confuting and confounding an antagonift by a feries of queftions. This courfe gave him a fceptical turn with regard to religion, and while he was young he took every opportunity of propagating his tenets, and with as much zeal as is fhewn by a new convert to any other doctrine. He was, however, foon convinced, by the effect produced on fome of his companions, that it was extremely dangerous to loofen the ties of religion without the probability of fubftituting other principles equally efficacious. The doubts which fubfifted in his own mind he was never able to remove; but he was not deficient in fortifying himfelf with fuch moral principles, as directed him to the moft valuable ends by honourable means. He, by habits of felf-denial, early formed in his mind, obtained a complete dominion over his appetites, fo that at the age of fixteen he readily difcarded animal food from the conviction produced in

in his mind by perufing a work on the fubject. He now offered his brother to maintain himfelf for half the fum paid for his board, and even with this he was able to make favings to purchafe what books he wanted. In his brother he found a harfh mafter, and Benjamin felt indignant at the treatment which he experienced from him in the way of bufinefs. The brother had fet up a newfpaper, in which the apprentice contrived to infert fome papers and effays anonymoufly, that were read and highly commended by people of the beft judgment and tafte in the town. The young man began now to feel his importance, which was ftill more impreffed on him by having the paper publifhed in his own name, that of his brother, for fome political offence, having been interdicted by the ftate. In confequence of this his indentures were cancelled, and he went to New York, and from thence to Philadelphia. Here he contracted an acquaintance with fome young men of a literary turn, in whofe fociety he fpent his evenings and improved his tafte. At Philadelphia he obtained the notice of fir William Keith, the governor, who urged him to fet up for himfelf, at the fame time promifing him fupport and protection. Franklin attempted to gain pecuniary aid from his parents, but was difappointed; the governor then perfuaded him to make a voyage to England to furnifh himfelf with all neceffaries for a new printing-office. He embraced the propofal, and accompanied by his friend Ralph he failed for England in 1725. Before his departure, he exchanged promifes of fidelity with Mifs Read of Philadelphia, with whofe father he had lodged. Upon his arrival in London, Mr. Franklin found that governor Keith, upon whofe letters of credit and recommendation he had relied, had entirely deceived him. He was now obliged to work as a journeyman printer, and obtained employment in an office in Bartholomew-clofe. His friend did not fo readily find the means of fubfiftence, and was a conftant drain upon the earnings of Franklin. In this great city the morals of the young travellers were not much improved; Ralph forgot, or acted as if he had forgotten, that he had a wife and child acrofs the Atlantic; and Franklin was as little attentive to the promifes and engagements he was under to Mifs Read. About this period he publifhed "A Differtation on Liberty and Neceffity, Pleafure and Pain," dedicated to Ralph, and intended as an anfwer to Woolafton's "Religion of Nature." This piece gained for him fome degree of reputation, and introduced him to the acquaintance of Dr. Mandeville, author of the "Fable of the Bees," and fome other literary characters. Franklin was always temperate and induftrious, and his habits in thefe refpects were eventually the means of fecuring his morals, as well as of raifing his fortune. In the interefting account which he has left of his own life, Mr. Franklin has given a narrative of the method which he took in reforming the fottifh habits of his fellow workmen in the fecond printing-office in which he was engaged in London, and which was fituated in the neighbourhood of Lincoln's-inn-fields. He tried to perfuade them that there was more real fuftenance in a penny roll than in a pint of porter; at firft the plan of economy which he propofed was treated with contempt or ridicule, but in the end he was able to induce feveral of them to fubftitute a warm and nourifhing breakfaft in the place of ftimulating liquors. In 1726 he returned to Philadelphia, where he firft engaged himfelf as clerk in a mercantile houfe; and in the courfe of a year he became the fuperintendant of Keimer's printing-office, where he acquired fo much efteem, and fo far improved his connections, that he refolved to embark in bufinefs for himfelf. He entered into partnerfhip with a fellow workman named Meredith, whofe friends were enabled to furnifh a fupply of money fufficient for the concern, which was no doubt very fmall; for Franklin has recorded the high degree of pleafure which he experienced from a payment of five fhillings only, the firft fruits of their earnings. "The recollection," fays this noble fpirited man, "of what I felt on this occafion, has rendered me more difpofed, than perhaps I might otherwife have been, to encourage young beginners in trade." His habitual induftry and undeviating punctuality obtained him the notice and bufinefs of the principal people in the place. He inftituted a club under the name of "the Junto," for the purpofe of the difcuffion of political and philofophical queftions, which proved an excellent fchool for the mutual improvement of its feveral members. The teft propofed to every candidate before his admiffion was this; "Do you fincerely declare that you love mankind in general, of what profeffion or religion foever? Do you think any perfon ought to be harmed in his body, name, or goods, for mere fpeculative opinions, or his external way of worfhip? Do you love truth for truth's fake; and will you endeavour impartially to find and receive it yourfelf, and communicate it to others." Mr. Franklin and his partner ventured to fet up a new public paper, which his own efforts as writer and printer caufed to fucceed, and they obtained likewife the printing of the votes and laws of the affembly. In procefs of time, Meredith withdrew from the partnerfhip, and Franklin met with friends who enabled him to undertake the whole concern in his own hands, and add to it the bufinefs of a ftationer. A difcuffion concerning a new emiffion of paper-money taking place, he wrote an anonymous pamphlet in favour of the meafure, which was received with applaufe, and which contributed to the fuccefs of the meafure, and to the profperity of the writer. In 1730 he married the lady to whom he had pledged his vows before he embarked for England, although, from his neglect of her, fhe had been before married to a man then dead. The eftablifhment of a public library was one of the ufeful projects of Franklin, which he brought to effect in 1731, and he had the fatisfaction of feeing it advance to that flourifhing ftate which it has long maintained. In 1732 he began to publifh "Poor Richard's almanac," a work which became remarkable by the number of excellent prudential maxims occafionally inferted in it, calculated, by their concifenefs, to be readily and indelibly impreffed on the memory. They have been fince collected into a fingle piece, entitled "The way to wealth," which has been publifhed in a variety of forms. The political career of Benjamin Franklin began in the year 1736, when he was appointed clerk to the general affembly of Pennfylvania; an office which he held for feveral years, till he was at length elected a reprefentative. In the following year he obtained the valuable office of poft-mafter to the city of Philadelphia. In 1738 he improved the police of the city, with refpect to the dreadful calamity of fire, by forming a fociety called a fire company, to which was afterwards added an affurance office againft loffes by fire. In the French war of 1744 he ftood forth and propofed a plan of voluntary affociation for defence, which was fhortly joined by 10,000 perfons. Franklin was chofen colonel of the Philadelphia regiment, which he did not accept, on account of the purfuits in which he was then engaged. Peter Collinfon had fent to the library fociety of Philadelphia an account of the curious facts relative to electricity, which then abforbed the attention of the European philofophers, together with a tube for experiments, and directions for its ufe. Franklin, with fome of his friends, immediately began to apply to the fubject, and in a fhort time he made many valuable and highly important difcoveries, an account of which he publifhed in three pieces, entitled "New experiments and obfervations in Electricity, made at Philadelphia in America." Although we may generally refer to the articles

Electrical *Attraction* and *Repulsion*, Electricity, &c. for full information on this subject, yet we cannot forbear giving some account of Mr. Franklin's discoveries. Having been led to think, that in the excitation of the electric tube the fluid was conveyed from the person who rubbed it, to him who touched it, he designated the state of the latter, by the expression of being electrified *positively* or *plus*, as having received more than his original quantity, while the former was said to be electrified *negatively* or *minus*, as having lost a part of his natural portion. This led to the discovery of the Leyden phial, the theory of which is, that when one side of the glass is electrified plus, the other side is electrified minus; so that in charging it, all that is done is to throw the electricity from one side, and convey it to the other, while discharging it is the restoration of the equilibrium. He farther demonstrated, by decisive experiments, that the accumulated electricity in the charged side of the phial resided not in the coating, but in the glass itself; but the most brilliant of his discoveries was that which proved the identity of the electric fluid and lightning. Their similarity had been suspected by the abbé Nollet, and some experiments had begun to be made in France towards the verification of the fact, but Franklin completed the proof of it entirely by his own experiments. In the year 1749 he conceived the idea of explaining the phenomena of thunder-gusts, and of the aurora borealis upon electrical principles; he pointed out many particulars, in which lightning and electricity agreed, and he adduced many facts and reasonings, from facts, in support of his positions. In the same year he thought of ascertaining the truth of his doctrine by drawing down the forked lightning, by means of sharp-pointed iron rods raised into the region of the clouds. Admitting the identity of electricity, and knowing the power of points in conducting away silently the electric fluid, he suggested the idea of securing houses, ships, &c. from the damages to which they were liable from lightning, by erecting pointed iron rods, which should rise some feet above the most elevated part, and descend some feet into the ground, or the water. The effect of these, he concluded, would be either to prevent a stroke by repelling the cloud beyond the striking distance, or by drawing off the electrical fluid which it contained; or, at least, conduct the stroke to the earth, without any injury to the building. It was not till the summer 1752, that Mr. Franklin was enabled to complete his grand experiment. The plan which he proposed was, to erect on some high tower, or other elevated place, a sort of hut, from which should rise a pointed iron rod, insulated by being fixed in a cake of resin. Electrified clouds passing over this would, he conceived, impart to it a portion of their electricity, which might be rendered evident to the senses by sparks being emitted, when the knuckle or other conductor was presented to it. While he was waiting for the erection of a spire, it occurred to him, that he might have more ready access to the region of clouds by means of a common kite; he accordingly prepared one for the purpose, affixing to the upright stick an iron point. The string was, as usual, of hemp, except the lower end, which was silk, and where the hempen part terminated, a key was fastened. With this simple apparatus, on the appearance of a thunder storm approaching, he went into the fields, accompanied by his son, to whom alone he communicated his intentions, dreading, probably, the ridicule which frequently awaits unsuccessful attempts in experimental philosophy. For some time no sign of electricity appeared; he was beginning to despair of success, when he suddenly observed the loose fibres of the string to start forward in an erect position. He now presented his knuckle to the key, and received a strong spark. How exquisite must his sensations have been at this moment? On this experiment depended the fate of his theory; repeated sparks were drawn from the key, a phial was charged, a shock given, and all the experiments made, which are usually performed with electricity. He immediately fixed an insulated iron rod upon his house, which drew down the lightning, and gave him an opportunity of examining whether it were positive or negative, and hence he applied his discovery to the securing of buildings from the effects of lightning. (See Conductor.) Previously to his experiments in electricity he applied his mechanical and philosophical knowledge to the construction of *fire-places* (which see), combining the qualities of an open grate with that of a stove. As a politician he had been elected a representative of the city of Philadelphia to the general assembly of the province. His principles in favour of equality of rights led him always to take the popular side, and he quickly obtained such an influence that he was regarded as the head of the party. The ability and punctuality which he had displayed in his office of post-master, caused him, in 1753, to be raised to the important employ of deputy post-master for the British colonies. He was useful in various other capacities to the government, and when in 1757 the militia was to be disbanded by orders from England, he sailed for London, in the capacity of agent for Pennsylvania, the assembly of which was involved in warm disputes with the proprietary interest. After much discussion before the privy council, it was agreed, that the proprietary lands should take their share in a tax for the public service, provided that Franklin would engage that the assessment should be fairly proportioned. The measure was accordingly carried into effect, and he remained at the British court as agent for his province, and his reputation caused him also to be entrusted with the like commission from Massachusets, Maryland, and Georgia. The molestation received by the British colonies from the French in Canada induced him to write a pamphlet, pointing out the advantages of a conquest of that province by the English; and the subsequent expedition against it, and its retention under the British government, at the peace, were, it is believed, much influenced by the force of his arguments on the subject. About this period his talents, as a philosopher, were duly appreciated in various parts of Europe. He was admitted a fellow of the Royal Society of London, and the degree of doctor of laws was conferred upon him at St. Andrew's, Edinburgh, and Oxford.

He returned to America in 1762, where he received the thanks of the assembly for his services, and a remuneration for his labours undertaken and accomplished on their behalf. He resumed his seat in that body, to which he had been annually elected during his absence, and continued to distinguish himself as a friend to the cause of the people. The active part which he took against the proprietary interest occasioned the loss of his election in 1764, but he was immediately re-appointed agent for the province, and embarked again for England. It was at this period that the stamp-act excited such violent commotions in America; and Dr. Franklin, almost immediately after his return to London, was called to the bar of the house of commons, to give evidence respecting the dispositions of the people to submit to it. His representations had a considerable effect in producing the repeal of that obnoxious measure. In the years 1766 and 1767 he paid visits to Holland, Germany and France, where he met with a very distinguished reception. In 1773 he attracted the public attention by a letter on the duel between Mr. Whately and Mr. Temple concerning the publication of governor Hutchinson's letters, avowing himself to be the person who obtained these letters and trans-

mitted them to the legiflature in America, which he had done from a fenfe of duty as the agent of the colony. This occafioned a violent clamour to be raifed againft him, and upon his attending before the privy council in the following January, to prefent a petition from the colony for the difmiffion of Mr. Hutchinfon, a moft virulent invective was pronounced againft him by Mr. Wedderburne, filled with all the abufe which too frequently characterizes the eloquence of the bar. In a very fhort time after this he was removed from his office of poft-mafter-general for America. Finding all his efforts to reftore harmony between Great Britain and the colonies ufelefs, he returned to America in 1775, juft after the commencement of hoftilities, and being named one of the delegates of the continental congrefs, he had the principal fhare in bringing about the revolution and declaration of independence on the part of America. In 1776, he was deputed by congrefs to Canada, to negociate with the people of that country, and to perfuade them to throw off the Britifh yoke; but the inhabitants of Canada had been fo much difgufted with the zeal of the people of New England, who had burnt fome of their chapels, that they refufed to liften to the propofals made to them by Dr. Franklin. On the arrival of lord Howe in America in 1776, he entered upon a correfpondence with him on the fubject of reconciliation. He was afterwards appointed, with two others, to wait upon the Englifh commiffioners, and learn the extent of their powers, but as thefe only went to the granting pardon upon fubmiffion, he joined his colleagues in confidering them as infufficient. Dr. Franklin was decidedly in favour of a declaration of independence, and was appointed prefident of the convention affembled for the purpofe of eftablifhing a new government for the ftate of Pennfylvania. When it was determined by congrefs to open a public negociation with France, Dr. Franklin was fixed upon to go to that country, and he brought about the treaty of alliance offenfive and defenfive, which produced an immediate war between England and France. Dr. Franklin was one of the commiffioners who, on the part of the United States, figned the provifional articles of peace in 1782, and the definitive treaty in the following year. Before he left Europe, he concluded a treaty with Sweden and Pruffia. By the latter he obtained feveral moft liberal and humane ftipulations in favour of the freedom of commerce, and the fecurity of private property during war, in conformity to thofe principles which he had ever maintained on thefe fubjects. Having feen the accomplifhment of his wifhes in the independence of his country, he requefted to be recalled, and after repeated folicitations Mr. Jefferfon was appointed in his ftead. On the arrival of his fucceffor he repaired to Havre de Grace, and croffing the Englifh channel, landed at Newport in the Ifle of Wight, from whence, after a favourable paffage, he arrived fafe at Philadelphia, in Sept. 1785. Here he was received amidft the acclamations of a vaft and almoft innumerable multitude, who had flocked from all parts to fee him, and who conducted him in triumph to his own houfe, where in a few days he was vifited by the members of congrefs, and the principal inhabitants of Philadelphia. He was afterwards twice chofen prefident of the affembly of Philadelphia; but in the year 1788 the increafing infirmities of his age obliged him to afk and obtain permiffion to retire and fpend the remainder of his life in tranquillity, and on the feventeenth of April 1790 he clofed, in ferenity and refignation, his active and ufeful life, having attained the great age of eighty-four years and three months. He left behind him one fon, a zealous loyalift, and a daughter married to a merchant in Philadelphia. Dr. Franklin was author of many tracts on electricity, and other branches of natural philofophy, as well as on political and mifcellaneous fubjects. Many of his papers are inferted in the Philofophical Tranfactions of London; and his effays have been frequently reprinted in this country as well as in America, and have, in common with his other works, been tranflated into feveral modern languages. Franklin's Life by himfelf. Prieftley's Hift. of Electricity.

Franklin, in *Geography*, a county of America, being the north-wefternmoft in Vermont, bounded N. by Lower Canada, and W. by lake Champlain. It contains 20 townfhips, and 8781 inhabitants.—Alfo, a county in Pennfylvania, bounded N. by Mifflin, N.E. by Cumberland, E. by York, S. by Wafhington county in Maryland, W. by Bedford county, and N.W. by Hunterdon. It is computed to contain 800 fquare miles, equal to 512,000 acres. It comprehends the middle part of the beautiful and rich valley of Conegocheague, watered by the creek of its name, which falls into Potowmack at Williams port in Maryland. Iron ore is found in this county fufficient to furnifh work for a furnace and forge. The county is divided into 14 townfhips, containing 19,638 inhabitants.—Alfo, a poft-town in Venango county, Pennfylvania; 322 miles from Wafhington.—Alfo, a poft-town of Ohio; 560 miles from Wafhington.—Alfo, a poft-town of Pendleton county, in Virginia; 191 miles from Wafhington.—Alfo, a poft-town in Williamfon county, Teneffee; 575 miles from Wafhington.—Alfo, a town in Duchefs county, New York, on the Connecticut line, 10 miles N.W. of Danbury; containing 1546 inhabitants.—Alfo, a county of Kentucky, bounded N. by Scott county, N.W. and W. by Shelby, S.E. by Fayette, and S. by Woodford. It contains 4450 inhabitants, of whom 1109 are flaves. The chief town is Frankfort.—Alfo, a county in Halifax diftrict, North Carolina, containing 8473 inhabitants, of whom 3667 are flaves. It is bounded N. by Greenville, S. by Johnfton, N.E. by Warren, S.W. by Wake, and W. by Orange county. The chief town is Lewifburg.—Alfo, a county in Virginia, bounded N. by Bedford, N.W. by Botecourt, W. by Montgomery, S.W. by Henry, S. by Patrick, and E. by Campbell county. It is about 40 miles long, and 25 broad, and contains 7728 free inhabitants, and 1574 flaves. It is generally hilly, and is traverfed on the N.W. by a range of the Alleghany mountains.—Alfo, a county in Georgia, fituated in the upper diftrict, bounded E. and N.E. by Tugulo river, which feparates it from the ftate of South Carolina; W. and N.W. by the country of the Cherokees; S. by the head branches of Broad river; and S.E. by Elbert county. It contains 6859 inhabitants, of whom 959 are flaves. The court-houfe is 77 miles from Wafhington.—Alfo, a townfhip in Norfolk county, Maffachufetts, incorporated in 1778, and containing 17,000 acres of land, and 1285 inhabitants. It is bounded N. by Charles river, which feparates it from Medway, and lies 30 miles S. of Bofton.—Alfo, a fmall ifle at the mouth of St. George's river, in Lincoln county, and ftate of Maine; four leagues fouthward of Thomafton.—Alfo, a poft-town in Delaware county, S.W. from, and bordering on, Harpersfield, and its W. line runs along the fouth-eaftern bank of the Sufquehannah river. This town was divided by an act of the legiflature in 1747. It contains 1390 inhabitants.—Alfo, a townfhip in Weftmoreland county, Pennfylvania.—Alfo, three others in the fame ftate, *viz.* in York county, Fayette county, and Wafhington county.—Alfo, a townfhip, being the northernmoft in New London county, Connecticut, 6 miles N.W. of Norwich; containing 1210 inhabitants, who are chiefly wealthy farmers.—Alfo, a county in the ftate of Ohio.

FRANKLIN *College.* See LANCASTER.

FRANKLIN, *Fort*, was erected in 1787 in Alleghany county, Pennfylvania, near the poft called Venango, in order to defend the frontiers of Pennfylvania from the depredations of the neighbouring Indians. It is feated on the S.W. bank of Alleghany river, oppofite to the mouth of the French creek; 53 miles S.S.E. of Prefque ifle, and 63 northward of Pittfburg. N. lat. 41° 1′ 40″. W. long. 79° 41′.

FRANKLINIA, in *Botany*, named by Marfhall in honour of the celebrated Dr. Benjamin Franklin. See GORDONIA.

FRANKS, in *Geography*, a town of Huntingdon county, Pennfylvania, on the Frankftown branch of Juniatta river, 20 miles W. of Huntingdon, and containing 743 inhabitants.

FRANKS, *Francs*, *Frankis*, or *Franquis*, a name which the Turks, Arabs, Greeks, &c. give to all the people of the weftern parts of Europe.

The appellation is commonly fuppofed to have had its rife in Afia, at the time of the croifades, when the French made the moft confiderable figure among the croiffees; from which time the Turks, Saracens, Greeks, Abyffinians, &c. ufed it as a common term for all the Chriftians of Europe; and called Europe itfelf Frankiftan.

The Arabs and Mahometans, fays M. d'Herbelot, apply the term Franks, not only to the French, (to whom the name originally belonged,) but alfo to the Latins and Europeans in general.

But F. Goar, in his notes on Condinus, cap. 5. n. 43, furnifhes another origin of the appellation Franks, of greater antiquity than the former. He obferves, that the Greeks at firft confined the name to the Franci, *i. e.* the German nations, who had fettled themfelves in France or Gaul, but afterwards they gave the fame name to the Apulians and Calabrians, after they had been conquered by the Normans; and at length the name was farther extended to all the Latins.

In this fenfe is the word ufed by divers Greek writers, as Comnenus, &c. who, to diftinguifh the French, call them the weftern Franks.

Du-Cange adds, that about the time of Charlemagne, they diftinguifhed eaftern France, weftern France, Latin, or Roman France, and German France, which was the ancient France, afterwards called Franconia.

The origin and confederacy of the Franks, whofe pofterity, in procefs of time, conquered Gaul, and impofed their own name on the country (fee FRANCE), have been the fubject of learned inveftigation, and of various conjectures and opinions. It has been fuppofed that Pannonia, that Gaul itfelf, and that the northern parts of Germany gave birth to this celebrated colony of warriors. At length (fays Gibbon, Hift. vol. i.) the moft rational critics, rejecting the fictitious emigrations of ideal conquerors, have acquiefced in a fentiment, whofe fimplicity perfuades us of its truth. They fuppofe, that about the year 240, probably under the reign of Gordian III. a new confederacy was formed under the name of Franks, by the old inhabitants of the Lower Rhine, and the Wefer. The diftrict which they originally inhabited was bounded on the N. by the ocean, on the W. by the ocean and the Rhine, on the S. by the Main, and on the E. by the Wefer: fo that according to this defcription they poffeffed the prefent provinces of Weftphalia, Heffe, and fome adjacent ftates. The Chauci, Cherufci, Catti, and other tribes of inferior power and authority, animated by the love of liberty, counted the enjoyment of it their richeft treafure; and of courfe the word that expreffed this enjoyment was the moft pleafing to their ears. Accordingly they deferved, they affumed, they maintained the honourable epithet of "Franks," or "freemen," which concealed, though it did not extinguifh, the peculiar names of the feveral ftates of the confederacy. Tacit confent, and mutual advantage, dictated the firft laws of the union; and it was gradually cemented by habit and experience. This league of the Franks in fome refpects refembles that of the Helvetic body; in which every canton, retaining its independent fovereignty, confults with its brethren in the common caufe, without acknowledging the authority of any fupreme head, or reprefentative affembly. But the principle of the two confederacies was extremely different. A peace of 200 years has rewarded the wife and honeft policy of the Swifs; whereas the inconftant fpirit, the thirft of rapine, and a difregard to the moft folemn treaties, difgraced the character of the Franks. The Rhine, though dignified with the title of the fafeguard of the provinces, proved to be an imperfect barrier againft the daring fpirit of enterprife with which the Franks were actuated; their rapid devaftations ftretched from the river to the foot of the Pyrenées; nor were they ftopped by thefe mountains. Spain, which had never dreaded, was unable to refift, the inroads of the Germans. When the exhaufted country no longer fupplied a variety of plunder, the Franks feized on fome veffels in the ports of Spain, and tranfported themfelves into Mauritania. Their irruptions into Gaul were repulfed by Aurelian, when he was only tribune of the fixth legion, when 700 of them were killed, and 300 made prifoners and fold for flaves; and again, in the fourth year of Valerian they made another excurfion, and were defeated by Gallienus; and after the captivity of Valerian, they again invaded Gaul, and having ravaged the moft wealthy provinces, made an irruption into Italy. At the death of Aurelian, the Franks, and fome other German tribes, croffed the Rhine and entered Gaul; and having reduced a great number of the chief cities, in two years confidered themfelves as mafters of the country; but under the reign of Probus, about A. D. 277, the Franks and other German tribes were driven back into their moraffes; from which defcriptive circumftances we may infer, that the confederacy known by the appellation of "free," already occupied the flat maritime country, interfected, and almoft overflown by the ftagnating waters of the Rhine, and that feveral tribes of the Frifians and Batavians had acceded to their alliance. The emperor, not fatisfied with driving them out of Gaul, purfued them acrofs the Rhine, laid wafte their territories, and built fome forts in their country; but upon their fuing for peace, they obtained it on condition of their fupplying the Romans yearly with a quantity of corn, and finding 16,000 men to ferve in the Roman army. Some of thefe Franks were eftablifhed by Probus, on the fea-coaft of Pontus, with a view of ftrengthening the frontiers againft the inroads of the Alani; but as a fleet ftationed in one of the harbours of the Euxine fell into their hands, they refolved, through unknown feas, to explore their way from the mouth of the Phafis to that of the Rhine. They eafily efcaped through the Bofphorus and the Hellefpont, and cruizing along the Mediterranean, indulged their appetite for revenge and plunder, by frequent defcents on the unfufpecting fhores of Afia, Greece, and Africa. The opulent city of Syracufe was facked by a handful of barbarians, who maffacred the greateft part of the trembling inhabitants.

From the ifland of Sicily the Franks proceeded to the columns of Hercules, trufted themfelves to the ocean, coafted round Spain and Gaul, and fteering their triumphant courfe through the Britifh channel, at length finifhed their furprifing voyage, by landing in fafety on the Batavian

or

or Frisian shores. This event happened about the year 280. Their countrymen, instructed by their example to despise the dangers of the sea, and animated by the hope of similar success, were led to pursue, in the indulgence of their enterprising spirit, a new road to wealth and glory. When Proculus revolted and assumed the title of emperor at Cologne, the Franks at first espoused his cause, but afterwards abandoned him, and betrayed the usurper into the emperor's hands. From this period to the fourth year of Dioclesian they continued quiet, till joining some Saxon pirates, they plundered the coast of Gaul, and carried off an immense booty, and an incredible number of captives; but Carausius having, by the emperor's order, equipped a fleet at Boulogne, and gained some advantages over them, they retired for a time to their respective countries. In the following year Maximian crossed the Rhine and desolated their country; which struck such terror into the minds of the Franks, that two of their kings or chiefs submitted to him, and requested to be confirmed by him in their respective kingdoms. Maximian granted lands in the vicinity of Treves and Cambray to great numbers of the Franks and Letes, who had submitted themselves; those territories being almost quite destitute of inhabitants. A few years after this transaction, the Franks reduced Batavia, and that part of Flanders which is watered by the river Escaut; but Constantius, the father of Constantine the Great, marched against them and defeated them in battle; and, having obliged them to surrender at discretion, he transplanted them and their families into Gaul, where they were obliged to cultivate the lands which they themselves had wasted, to pay the usual tributes and taxes, as subjects of the empire, and to serve, when wanted, in the Roman armies. From this period, A. D. 293, they continued quiet till the year 306, the first year of Constantine's reign, when they seized the opportunity afforded them by his absence in Britain to invade Gaul; but the emperor, on his return, pursued them with dreadful havoc across the Rhine, and took many prisoners. During Constantine's reign they made several irruptions into Gaul, which drew upon them very severe punishment. When Constantius, in the blind fury of civil discord, about the middle of the fourth century, had abandoned to the barbarians of Germany the countries of Gaul, which still acknowledged the authority of his rival, a numerous swarm of Franks and Alemanni were invited to cross the Rhine by presents and promises, by the hopes of spoil, and by a perpetual grant of all the territories which they should be able to subdue. These formidable allies the emperor found it difficult to dismiss; and, acting the part of undisciplined robbers, they pillaged 45 flourishing cities, and several towns and villages, and reduced many of them to ashes. The German barbarians, abhorring the confinement of walls, fixed their independent habitations on the banks of rivers, the Rhine, the Moselle, and the Meuse, and secured themselves against surprise by a rude and hasty fortification of large trees, which were felled and thrown across the roads. At this time the Franks occupied the island of the Batavians, together with an extensive district of Brabant, which was then known by the appellation of Toxandria, a country of woods and morasses that extended from the vicinity of Tongres to the conflux of the Vahal and the Rhine, and which may be considered as the original seat of their Gallic monarchy. After Julian, A. D. 358, had repulsed the Alemanni from the provinces of the Upper Rhine, he turned his arms against the Franks, who were seated nearer to the ocean on the confines of Gaul and Germany; and who, on account of their number and intrepid valour, had ever been esteemed the most formidable of the barbarians. Although they were strongly actuated by the allurements of rapine, they professed a disinterested love of war, which they considered as the supreme honour and felicity of human nature; and their minds and bodies were so completely hardened by perpetual action, that, according to the lively expression of an orator, the snows of winter were as pleasant to them as the flowers of spring. In the month of December, A. D. 358, Julian attacked a body of 600 Franks, who had thrown themselves into two castles on the Meuse. Having, with inflexible constancy, in the midst of that severe season, sustained a siege of 54 days, they were at length exhausted by hunger, and despairing of escape, they consented, for the first time, to dispense with the ancient law, which commanded them to conquer or to die. This obstinate resistance on the part of a small number of Franks, apprised Julian of the difficulties with which he was likely to encounter in the expedition meditated by him for the ensuing spring, against the whole body of the nation. His diligence and activity corresponded to the occasion; and without allowing the Franks to deliberate or to unite, he spread his legions from Cologne to the ocean, and soon constrained the suppliant tribes to implore the clemency, and to obey the commands, of their conqueror. A treaty was ratified by solemn oaths; and perpetual inspectors were appointed to reside among the Franks, with the authority of enforcing the strict observance of the conditions. Towards the commencement of the 5th century, the Franks distinguished their zeal and courage in the defence of the Roman empire: when the limits of Gaul and Germany were shaken by the northern emigration, the Franks bravely encountered the single force of the Vandals; and of these 20,000, with their king Godigisclus, were slain on the field of battle. By this attachment to the Roman government, on the part of the Franks, as well as by the neutrality of the Alemanni, the peace of Germany was secured. In the last years of the emperor Honorius, the Franks, as well as the Goths and Burgundians, obtained a permanent seat and dominion in the provinces of Gaul; Treves, the capital of Gaul, was pillaged by their lawless bands; and the humble colony, which they so long maintained in the district of Toxandria in Brabant insensibly multiplied along the banks of the Meuse and Scheldt, till their independent power filled the whole extent of the Second, or Lower Germany. It was about this time, A. D. 420, that Pharamond, supposed by some to be the son of Sunno, but more generally the son of Marcamir, the brother of Sunno, is said to have reigned over the Franks: but the foundation of the French monarchy by Pharamond, the conquests, the laws, and even the existence of that hero, have been justly arraigned, says Gibbon, by the impartial severity of modern criticism. Pharamond, if we admit the existence of such a sovereign among the Franks, was succeeded by his son Clodion in the year 428, the fourth of the reign of Valentinian III. From the report of his spies, the king of the Franks was informed that the defenceless state of the second Belgic must yield, on the slightest attack, to the valour of his subjects. He boldly penetrated the thickets and morasses of the Carbonarian forest, which is part of the great forest of the Ardennes, that lay between the Escaut or Scheldt, and the Meuse; occupied Tournay and Cambray, the only cities which existed in the 5th century, and extended his conquests as far as the river Somme, over a desolate country, whose cultivation and populousness are the effects of more recent industry. While Clodion lay encamped in the plains of Artois, and employed himself in celebrating, with ostentatious security, the marriage of one of his chiefs, perhaps of his son, the nuptial feast was interrupted by the unexpected arrival and assault of Ætius. The Franks were oppressed before they could recover their

arms or their ranks; and their unavailing valour was fatal only to themſelves. The king of the Franks, however, ſoon regained his ſtrength and reputation, and ſtill maintained the poſſeſſion of his Gallic kingdom from the Rhine to the Somme. Under his reign, and moſt probably from the enterpriſing ſpirit of his ſubjects, the three capitals, Mentz, Treves, and Cologne, experienced the effects of hoſtile cruelty and avarice. The diſtreſs of Cologne was prolonged by the perpetual dominion of the ſame barbarians who evacuated the ruins of Treves; and Treves, which in the ſpace of forty years had been four times beſieged and pillaged, was diſpoſed to loſe the memory of her afflictions in the vain amuſements of the circus.

The death of Clodion, after a reign of twenty years, expoſed his kingdom to the diſcord and ambition of his two ſons. Meroveus, the younger, was perſuaded to implore the protection of Rome; he was received at the imperial court as the ally of Valentinian, and the adopted ſon of the patrician Ætius; and diſmiſſed to his native country with ſplendid gifts, and the ſtrongeſt aſſurances of friendſhip and ſupport. During his abſence, his elder brother had ſolicited, with equal ardour, the formidable aid of Attila; and the king of the Huns embraced an alliance, which facilitated the paſſage of the Rhine, and juſtified, by a ſpecious and honourable pretence, the invaſion of Gaul. Meroveus died, as ſome ſay, in 456, but, according to others, in 458; after having lived and reigned, loved and honoured by his people as a common father; and from him the Franks in general were called Merovingians. In a genealogical table of the French kings, prefixed to a MS. life of Charles the Great, lodged in the royal library at Bruſſels, he is made the ſtock or head of the firſt race. Meroveus was ſucceeded by his ſon Childeric. As ſoon as he aſcended the throne he began to think of enlarging his dominions; and he is ſaid to have extended his conqueſts as far as the Loire, and to have reduced the city of Paris, after a ſiege of ten years. He likewiſe made himſelf maſter of Angers and alſo of Orleans. He died at Tornacum, now Tournay. In early life he was addicted to very licentious practices, and the Franks, incenſed by his conduct, puniſhed him with exile, and elected Œgidius, a Roman general, for their king. However, the nation, at the end of four years, repented of the injury which they had offered to the Merovingian family, and patiently acquieſced in the reſtoration of the exiled prince. While Childeric lived an exile in Germany, he was hoſpitably entertained by the queen as well as by the king of the Thuringians. After his reſtoration, Baſina eſcaped from her huſband's bed to the arms of her lover. Childeric is ſaid to have married her; but however that be, the offspring of their union was Clovis; who, when he was no more than fifteen years of age, ſucceeded by his father's death, A. D. 482, to the command of the Salian tribe. The narrow limits of his kingdom were confined to the iſland of the Batavians, with the ancient dioceſes of Tournay and Arras; and at the baptiſm of Clovis, the number of his warriors could not exceed five thouſand. The kindred tribes of the Franks, who had ſeated themſelves along the Belgic rivers, the Scheldt, the Meuſe, the Moſelle, and the Rhine, were governed by their independent kings, of the Merovingian race; the equals, the allies, and ſometimes the enemies, of the Salic prince. But the Germans who obeyed, in peace, the hereditary juriſdiction of their chiefs, were free to follow the ſtandard of a popular and victorious general; and the ſuperior merit of Clovis attracted the reſpect and allegiance of the national confederacy. (See CLOVIS.) In the year 536, twenty-five years after the death of Clovis, the French monarchy in Gaul was finally eſtabliſhed. The Oſtrogoths of Italy, unable to defend their diſtant acquiſitions, had reſigned to the Franks the cities of Arles and Marſeilles; this tranſaction was confirmed by the imperial authority, and Juſtinian, generouſly yielding to the Franks the ſovereignty of the countries beyond the Alps, which they already poſſeſſed, abſolved the provincials from their allegiance; and eſtabliſhed on a more lawful, though not more ſolid, foundation, the throne of the Merovingians. (See FRANCE.) The Franks, or French, are the only people of Europe who can deduce a perpetual ſucceſſion from the conquerors of the weſtern empire. But their conqueſt of Gaul was followed by ten centuries of anarchy and ignorance.

The Franks were tall of ſtature, with light hair and blue eyes; and as to their military character, we may obſerve, that their love of freedom and of arms was felt, with conſcious pride, by the Franks themſelves, and it was obſerved by the Greeks with ſome degree of amazement and terror. "The Franks," ſays the emperor Conſtantine, "are bold and valiant to the verge of temerity; and their dauntleſs ſpirit is ſupported by the contempt of danger and of death. In the field, and in cloſe onſet, they preſs to the front, and ruſh headlong againſt the enemy, without deigning to compute either his numbers or their own. Their ranks are formed by the firm connections of conſanguinity and friendſhip; and their martial deeds are prompted by the deſire of ſaving or revenging their deareſt companions. In their eyes, a retreat is a ſhameful flight: and flight is indelible infamy." Gibbon's Hiſt. of the Decline, &c. of the Roman Empire. The Franks, as we have already remarked, inhabited foreſts and marſhes, where their women reſided; their cabins were of wood, conſtructed without art, and formed into ſcattered villages without order. Theſe ſavages united together under the command of a prince, and went with him to war, without acknowledging his dominion over them in time of peace: their princes were rather the chiefs of the ſoldiers than the kings of the people: they paid him no tribute, divided the ſpoils, and made him preſents. Such were the conquerors of Gaul, and the founders of the French monarchy. (See FRANCE.) In proceſs of time they became Chriſtians, and inſenſibly loſt their ancient manners. Their democracy was aboliſhed, and a military ariſtocracy ſucceeded.

FRANKSTADT, in *Geography*, a town of Moravia, in the circle of Prerau; four miles S. of Freyburg. N. lat. 49° 29'. E. long. 18° 17'.

FRANKWALD, or PUSKOWITZ, a town of Sileſia, in the principality of Oels; four miles N.W. of Feſtenberg.

FRANQUEMONT, a town of Switzerland, in the canton of Porentru, ſeated on the Dou; 16 miles N. of Neufchatel.

FRANSCHE HOECK, or *French Corner*, a ſubordinate diſtrict of the valley of Drakenſtein in ſouthern Africa, near the Cape of Good Hope, ſituated in the S.E. angle of the valley among the mountains; deriving its name from the French refugees who ſettled here, when they fled to this country after the revocation of the edict of Nantes. To theſe people the colony is indebted for the introduction of the vine. The eſtates here are commonly freehold property, and produce little elſe than wine and fruits.

FRANSERIA, in *Botany*, named by Cavanilles in honour of Dr. Antony Franſero, a phyſician of Madrid, rather, as it ſeems, from motives of perſonal regard, than from any botanical merits in his friend. Cav. Ic. 2. 78. Willd. Sp. Pl. v. 4. 378. Claſs and order, *Monœcia Pentandria*. Nat. Ord. *Compoſitæ nucamentaceæ*, Linn. *Corymbiferæ anomalæ*, Juſſ.

Gen. Ch. *Male Flowers* compound. *Cal.* Common Perianth of one leaf, flat, toothed, the length of the florets. *Cor.* compound, uniform, tubular, equal, forming a hemiſphere; partial erect, of one petal, funnel-ſhaped, five-cleft.

Stam.

Stam. Filaments five, very small; anthers erect, parallel, distinct, furrowed. *Pist.* Germen abortive; style thread-shaped; stigma peltate.

Female Flowers below the male, on the same plant. *Cal.* Perianth of several ovate leaves, containing a single flower. *Cor.* none. *Pist.* Germen superior, ovate, muricated; styles four; stigmas eight, oblong. *Peric.* Drupa dry, cloathed with rigid hooked bristles, of four cells, with one oblong *seed* in each cell.

Eff. Ch. Male, Common calyx of one leaf, with many teeth. Corolla monopetalous, tubular, with five teeth. Receptacle naked.

Female, Calyx of many leaves, single-flowered. Corolla none. Styles four. Drupa dry, bristly, of four cells.

1. F. *artemisioides.* Willd. Hort. Berol. v. 1, 2. t. 2. (Xanthium fruticosum; Linn. Suppl. 418. Ambrosia arborescens; Mart. Mill. Dict. v. 1. n. 5. Lam. Dict. v. 1. 128.)—Leaves doubly-pinnatifid, toothed.—Native of Peru. It may be found in some curious gardens, and has of late been treated in England with some attention, from being supposed a white variety of *Chrysanthemum indicum*, but the mistake was rectified when its miserable flowers appeared. The *stem* is perennial, somewhat woody, leafy. *Leaves* deeply and doubly pinnatifid, pointed, toothed, most downy beneath. *Flowers* very late, greenish, the male resembling those of an *Artemisia*, the female and the fruit being like a *Xanthium*.

2. F. *ambrosioides.* Willd. Sp. Pl. v. 4. 379. Cav. Ic. v. 2. 79. t. 200, excluding the synonyms. (Ambrosia maritima peruviana major; Hort. Reg. Parif. MSS.)—Leaves lanceolate, pinnatifid, toothed, with elongated points.—Native of Mexico and Peru. Larger than the last, with which Cavanilles confounds it. The *leaves* are much more elongated, and only simply pinnatifid, sometimes undivided. The appendages on their *footstalks*, on which Willdenow founds a part of his specific character, seem to be only accidental and transient lobes.

This genus is akin on the one hand to *Ambrosia*, on the other to *Xanthium*, its habit and male flowers being most like the former, its fruit resembling the latter; yet we do not see that it can satisfactorily be referred to either. How far the two species of *Franseria* are permanently distinct may admit of some doubt, but they appear very different in foliage.

FRANTSILA, in *Geography*, a town of Sweden, in the government of Ulea; 30 miles S.E. of Brahested.

FRANTZDORF, a town of Silesia, in the principality of Neisse; four miles N. of Neisse.

FRANTZIUS, Wolfgang, in *Biography*, a learned German Lutheran divine, was born in Saxony in the year 1564. He received the early part of his education at Frankfort on the Oder, whence he was sent to the university of Wittemberg, where he was appointed professor of history, and admitted to the degree of doctor of divinity in the year 1598: and in 1605 he was advanced to the theological chair in the same university. He died in 1628, when he had attained his sixty-fourth year. He was a considerable writer, chiefly on theological subjects, and on the controverted doctrines of the day. Moreri.

FRANZBURG, in *Geography*, a town of Swedish Pomerania, founded, in 1587, on the scite of a rich abbey; 14 miles S.S.W. of Stralsund. N. lat. 54° 10′. E. long. 12° 56′.

FRAPPE', *Fr.*, used substantively in *Music*, for the first note of a bar when the hand or foot *beats* the time. (See Theses.) The French, in beating time, only mark the first note or accent of a bar, but indicate its other portions by different motions of the hand; as in compositions where the bar consists of four crotchets, the first, or *down* part is beaten, at the second, the hand is waved to the left, at the third lifted up, and at the fourth waved to the right. In triple time, if not very quick, at the first note the hand is beaten bown, at the second waved to the left, and at the third lifted up. The Italians *beat* the two first notes of a bar in triple time, and lift the hand *up* at the third. In common time of four crotchets they likewise *beat* the two first, and lift up the hand for the two others.

FRAPPING, in *Sea Language*, denotes the act of crossing and drawing together the several parts of a tackle, or other complication of ropes, which had been already straightened to their utmost extent, resembling the operation of bracing up a drum, &c. The frapping increases the tension, and adds to the security acquired by the purchase. Hence the cat-harpings are no other than frappings to the shrouds.

Frapping *a Ship*, is the act of passing three, four, or five turns of a cable round the hull, or frame of a ship, in the middle, to support her in a great storm, when it is apprehended she is not strong enough to resist the violent efforts of the sea. This is seldom used, except in old ships. Falconer.

FRASCARUOLA, in *Geography*, a town of Italy, in the department of the Gogna; three miles N.E. of Valenza.

FRASCATI, or Frescati, an agreeable town, or rather village, in the Campagna di Roma, the see of a bishop, who is a cardinal, seated on the declivity of a hill, about twelve miles from Rome. It derives its name from the coolness of the air, and fresh verdure of the fields about it; and it is celebrated for the palaces and country seats of Italian princes and cardinals, adorned with many beautiful paintings and sculptures. The hills on which Frescati is situated afford great abundance of water, which supplies fountains, cascades, and water-works with which the villas are ornamented. This was the scite of the ancient Tusculum, destroyed by the Romans in 1191, or very near it; and at the distance of about a mile and a half, it is generally believed, was the Tuscan villa of Cicero, at a place now called Grotta Ferrata. Some Greek monks of the order of St. Basil, flying from the persecution of the Saracens in the 11th century, were permitted to build a convent on the ruins of Cicero's famous house; and they still perform the service in the Greek language. At a small distance is the lake of Nemi, four miles in circumference, whose surrounding hills are covered with tall and shady trees. In ancient times there was a temple here, sacred to Diana. The lake itself was called Speculum Dianæ, and Lacus Triviæ, and is the place mentioned in the 7th book of the Æneid, where the fury Alecto is described blowing the trumpet of war, at whose dreadful sound the woods and mountains shook, and mothers, trembling for their children, pressed them to their bosoms.

"Contremuit nemus, et sylvæ intonuere profundæ,
Audiit et Triviæ longus lacus———————
Et trepidæ matres pressere ad pectora natos."

FRASERA, in *Botany*, so called by Walter, in honour of his indefatigable friend Mr. John Fraser, nursery and seedsman of Sloane-square, to whom our gardens are indebted for many American plants. Walt. Fl. Carolin. 87. This is no other than *Swertia difformis* of Linnæus, which name was given it because the flowers vary in number of parts from four to six; nor does it appear to us that it can be separated from *Swertia*, though the corolla is much more strongly and remarkably bearded than in *S. perennis*, and the styles united into one.

FRASERBURGH, in *Geography*, a town in Aberdeenshire, situated on the south side of the promontory, called

Kinnaird's head, forty-one miles diſtant from Aberdeen, was erected into a borough of regality in 1613. The government is veſted in lord Saltoun, as provoſt, two bailiffs, a dean of guild, and council; and his lordſhip, as ſuperior, has the power annually of nominating and appointing the new governors, with the joint conſent of the old. The ſtreets are ſpacious and convenient, croſſing each other at right angles; the houſes well built, and, being covered with ſlate, give a neat and cheerful appearance to the place. Nearly in the centre ſtand two good public edifices, the town-houſe and priſon. In an area of about five hundred feet ſquare is an elegant croſs. This fine ſtructure conſiſts of an hexagonal pedeſtal, ſupported by three equidiſtant abutments of a ſimilar figure, and ſurmounted by a column twelve feet high, ornamented with the arms of Britain, and thoſe belonging to the family of Fraſer. At the weſt end of the town is an ancient quadrangular tower of three ſtories in height, which forms part of a building, intended for a college, but never carried further into effect. Sir Alexander Fraſer, in the year 1592, obtained a charter from the crown, empowering him to erect an univerſity "in ampliſſima forma," and in all reſpects like other univerſities within theſe realms; but from ſome latent and unauſpicious circumſtances the veſted powers of the charter were never executed. There are the remains alſo of ſeveral ancient towers, and veſtiges of religious ſtructures. According to the returns under the population act in 1801, the number of houſes was 490, and inhabitants 2215; of whom 217 were returned as employed in trade. The only manufacture is linen yarn, the quantity of which annually exported is to the amount of three or four thouſand pounds. Fraſerburgh poſſeſſes a ſmall, yet excellent harbour, having from eleven to ſixteen feet water, admitting ſhips of 300 tons burden to enter; and a good roadſtead contiguous, about one mile broad, and four in length, with ſafe anchorage ground; near which is the ſmall fiſhing village of Broadſea. Near the town is a caſtle, on a promontory called Kinnaird's head, bathed on two ſides by the ſea. On the top of this caſtle government lately erected a light-houſe, containing 20 lamps with reflectors. Fiſhing-banks for cod commence right off Kinnaird's head, ten leagues out at ſea. N. lat. 57° 33′. W. long. 1° 55.

In the immediate vicinity of the town ſtands Philorth houſe, ſurrounded by extenſive plantations, the ſeat of the right honourable George Fraſer, lord Saltoun and Abernethy.

FRASI, Giulia, of Bologna, in *Biography*, a ſcholar of Brevio of Milan, came into England in 1743, the ſecond year of the earl of Middleton's opera regency, as third ſinger under Monticelli, and the Viſconti. Fraſi at this time was young and intereſting in her perſon, had a clear and ſweet voice, free from defects, and a ſmooth and chaſte ſtyle of ſinging; which, though cold and unimpaſſioned, pleaſed natural ears, and eſcaped the cenſure of critics. Galli arrived here at the ſame time, and after tranſplantation from Italy, they both took root in this country, and remained here in great public favour during many years. The firſt opera in which they appeared was Galuppi's "Enrico." Both theſe performers, by learning Engliſh, rendered themſelves important and neceſſary, on many occaſions, in our oratorios, theatres, and public concerts, when ſingers of a much higher claſs, without this qualification, could be of no uſe. In Italian ſinging, Fraſi's "Cheval de bataille" was the fine air, "Tremende occuri attroci," in Pergoleſi's Olimpiade, which Monticelli had ſung in the opera, but which ſuiting the compaſs and powers of Fraſi, ſhe ſung at concerts with great applauſe for ten years at leaſt, after the run of the opera was over. The great opera houſe being ſhut up this year on account of the rebellion, and popular prejudice againſt the performers, who being foreigners, were chiefly Roman catholics; an opera was attempted, April 7th, at the little theatre in the Haymarket, under the direction of Geminiani. Paſquali led the orcheſtra, and the celebrated and myſterious count St. Germain compoſed ſeveral new airs for it, particularly "Per pieta bell' idol mio," which was ſung by Fraſi, firſt woman, and encored every night. The reſt of his airs, and two by Brevio, Fraſi's maſter, which Walſh printed, were only remarkable for inſipidity. The firſt man's part was performed by Galli. The ſucceſs of this enterprize was inconſiderable, and the performances did not continue more than nine or ten nights. Prince Lobkowitz, who was here at this time, and conſtantly with count St. Germain, attended all the rehearſals, as well as the performances. In 1748 Fraſi performed the part of firſt ſerious woman in the comic opera at the Haymarket, when Pertici and Laſchi, the beſt buffos that we ever ſaw, were here, and Guadagni, then very young, was the firſt ſerious man. In 1750, there being a ſchiſm in the great theatre, the compoſer, Ciampi, and the performers, left the manager, Dr. Croza, and erected their ſtandard at the little theatre on the oppoſite ſide the way, where Fraſi performed the firſt woman's part in "Adriano in Siria," a new ſerious opera compoſed by Ciampi, in which Guadagni, then but a wild ſinger, with a very fine counter-tenor voice, appeared as firſt man; but after ſix thin houſes, this opera was ſuperſeded by the burlettas of the preceding winter. Though Fraſi was a great ſinger among the Engliſh vocal performers of theſe times, in 1754, ſhe was only rated as third woman at the great opera, giving place to the Viſconti and Paſſerini.

The next year, however, during the indiſpoſition of the Mingotti, Fraſi was often called upon as her *double*, till ſuſpicions ariſing that Mingotti's was a mere dramatic and political cold, the public was much out of humour, till ſhe reſumed her function in Metaſtaſio's admirable drama of "Demofoonte," in which ſhe acquired more applauſe, and augmented her theatrical conſequence beyond any period of her performance in England.

Fraſi's favour, however, was ſo eſtabliſhed in all our muſical performances elſewhere throughout the kingdom, that ſhe ſang at Ranelagh, at the triennial meetings at Worceſter, Hereford, and Glouceſter; at the two univerſities, and in London at the Swan, King's Arms, and Caſtle concerts, at the concert at Hickford's Room, Brewer-ſtreet, at all benefit concerts; and was the principal ſinger in Handel's oratorios during the laſt ten years of his life. Having come into this country at an early period of her life, ſhe pronounced our language in ſinging in a more articulate and intelligible manner than the natives; and her ſtyle being plain and ſimple, with a well-toned voice, a good ſhake, and perfect intonation, without great taſte and refinement, ſhe delighted the ignorant, and never diſpleaſed the learned. Yet with all this apparent proſperity, and a clear income of from 1100*l.* to 1800*l.* a year, ſhe literally died a beggar! And this in a great meaſure was occaſioned by poor Fraſi's too liberal ſpirit of hoſpitality towards the natives of Italy; who, coming to this country on mere ſpeculation, without any means of ſubſiſtence, preyed upon her, and conſtantly kept her in uneaſy circumſtances. By her want of economy, and little attention to her expences, they every year exceeded her income ſo much, that, at length, ſhe was obliged to quit this country to avoid being arreſted. Her youth and talents faded; her ſole reſources for her future ſubſiſtence were the penſions of ten or twelve Engliſh patrons, who ſubſcribed five guineas a year each during her and their proper lives. Among theſe was the late viſcount Barrington, and the admiral

miral his brother, the late lady Harrington, Meſſrs. Bradſhaw, Chamier, &c. For the convenience of receiving theſe benefactions ſhe ſettled at Calais, where, by the utmoſt parſimony, ſhe was able to ſupport a miſerable exiſtence, till, by the death of her benefactors, her income was at length reduced to ten or fifteen guineas a year, and we fear that her own death was ſomewhat accelerated by mere inanition!

Theſe melancholy particulars are here inſerted to warn our fair ſongſtreſſes againſt extravagance, and to remind them that faſhion and favour are ſeldom long-lived, no more than talents and beauty; and that expending their whole income in proſperous years is a ſure ſtep to indigence and miſery, if they ſhould arrive at old age. Such, alas! has been the fate, not only of Fraſi, but of the celebrated Cuzzoni, Galli, Gabrielli, Miſs Brent, &c. &c.

FRASIGNORE, in *Geography*, a town of Etruria; 7 miles N. of Piſtoia.

FRASLA, a town of the duchy of Stiria; 10 miles W. of Cilly.

FRASNES, a town of France, in the department of Jemmappe, and chief place of a canton in the diſtrict of Tournay. The place contains 3,094, and the canton 12,046 inhabitants, on a territory of 137½ kiliometres, in 13 communes.

FRASSEN, Claude, in *Biography*, was born near Peronne, in Picardy, in the year 1620; he was regularly educated in a convent belonging to the order of his native town, and after his profeſſion was ſent to purſue his ſtudies at the great Franciſcan convent at Paris. He took his degrees at the Sorbonne, and was admitted to that of doctor of divinity in the year 1662. He was frequently elected ſuperior to his order, and filled the office of theological profeſſor nearly thirty years. In 1682 he aſſiſted at a general chapter of his order, which was held at Toledo in Spain, and on account of his prudence and talents he was elected definitor general of the whole order. His wiſdom in conducting public official buſineſs was not confined to religious duties only; he was often conſulted by Lewis XIV., the parliament of Paris, the higher orders of the clergy, &c. on buſineſs of peculiar importance and intereſt. He died in 1711, in the ninety-fourth year of his age. He was author of "A ſyſtem of Philoſophy," in three volumes 4to. and of ſeveral theological and devotional pieces. Moreri.

FRASSETUM, in our *Old Writers*, is taken for a wood, or woody ground, where aſh grows. 1 Inſt. 4.

The word is a corruption of the Latin *fraxinetum*, which ſignifies the ſame.

FRASSINETO, in *Geography*, a town of Naples, in the province of Bari; 9 miles S.S.W. of Converſano.—Alſo, a town of Italy, in the Paduan; 2 miles N. of Montagnana.

FRATELLI, two ſmall iſlands in the Mediterranean; 25 miles W. from Scarpanto. N. lat. 35° 45′. E. long. 26° 22′.

FRATER Consanguineus, in *Law*, denotes a brother by the father's ſide; and *Frater uterinus*, a brother by the mother's ſide.

FRATERCULA, in *Ornithology*, a name by which Geſner and Aldrovand have called the *anas arctica cluſii*. See Alca *arctica*, and Puffin.

FRATER-HOUSE; the brethrens' hall, refectory, or eating-room in the ancient monaſteries was frequently called by this name.

FRATERIA, of *frater*, *brother*, a fraternity, brotherhood, or ſociety of religious perſons, who were bound to pray for the good health and life, &c. of their living brethren, and the ſouls of thoſe that were dead. In the ſtatutes of the cathedral church of St. Paul, London, collected by Ralph Baldock, dean, 1295, there is one chapter "De frateria beneficiorum eccleſiæ S. Pauli, &c."

Frateria, or *Phrateria*, in *Ancient Geography*, a town of Dacia, on the bank of the Mariza. Ptolemy.

FRATERNITY, Brotherhood, the relation or union of brothers, friends, partners, and aſſociates, &c.

Fraternity, in a *civil ſenſe*, is uſed for a guild, aſſociation, or ſociety of perſons, united into a body, for ſome common intereſt or advantage.

For the origin, uſe, &c. of fraternities, ſee Company and Gild.

Fraternity, in a *religious ſenſe*, is a ſociety of perſons meeting together to perform ſome exerciſes of devotion, or divine worſhip.

In the Romiſh church, ſuch fraternities are very numerous and conſiderable, being moſt of them eſtabliſhed by royal patents; as the fraternity of the Roſary; the fraternity of the Scapulary of St. Francis's Cord; ſee Cordeliers and Franciscans. The biſhop may hinder the eſtabliſhment of any ſuch fraternity in his dioceſe.

At Rome there is a fraternity, called the archi-fraternity, or grand fraternity, under the title of "Our Lady of the Suffrages," eſtabliſhed in favour of the ſouls in purgatory, approved and confirmed by a bull of pope Clement VIII. in 1594. See Brethren and Brothers.

There are nine different ſorts of fraternities, or confrairies, in France, *viz.* 1. Of Devotion. 2. Of Charity, or Mercy. 3. Of Penitents, under divers names. 4. Of Pilgrimage. 5. Of Merchants to procure the divine favour on their endeavours. 6. Of Officers of Juſtice. 7. Of the ſufferings of Chriſt. 8. Of Arts and Trades of divers kinds. And, 9. Of Factions.

Fraternities, in Latin called *ſodalitates*, derive their origin from the heathens, as is ſhewn by Polydore Virgil, in his book "De Inventoribus Rerum." But the good uſe made of them by the Chriſtians has effectually purged them of any impurities derived from ſo ill a ſource.

Numa Pompilius is ſaid to have eſtabliſhed fraternities of all arts and trades in ancient Rome, and to have preſcribed the ſacrifices each profeſſion was to perform to the patrons or tutelary gods he had aſſigned them.

Fraternity *of the holy Trinity*. See Trinity.

Fraternity is alſo a title or quality which kings and emperors gave to each other; ſo alſo do biſhops and monks. We meet with it frequently in authors under the eaſtern empire, both Greek and Latin: the Greek term is ἀδελφότης, *fraternitas*.

Fraternity *of Arms* was an alliance, or aſſociation in arms, anciently concluded between two knights, who thereby agreed to go together, ſhare their fortunes, and mutually aſſiſt each other againſt all the world.

Bertrand du Gueſclin and Oliver Cliſſon ſwore a fraternity of arms in the year 1579, laying their hands on the goſpels. Hiſt. de Bret. tom. i. p. 395.

Fraternity *of St. Catharine*. See Catharine.

FRATING, or Wrateni, in *Geography*, a town of Moravia, in the circle of Znaym; 22 miles W.N.W. of Znaym.

FRATINO, a town of Italy, in Friuli; 25 miles S.W. of Udina.

FRATRES Arvales. See Arvales.

Fratres *Conjurati*, in our *Ancient Law-books*, &c. denote ſworn brothers, or companions.

Sometimes they are ſo called who were ſworn to defend the king againſt his enemies, leg. W. 1. cap. 59. "Præcipimus, ut omnes liberi homines ſint fratres conjurati ad monarchiam

narchiam noftram & regnum noftrum contra inimicos pro poffe fuo defendendam."

FRATRES *Gaudentes.* See *Joyful* BROTHERS.

FRATRIAGE, FRATRIAGIUM, or *Frerage*, the partition among brothers, or coheirs, coming to the fame inheritance or fucceffion.

FRATRIAGE is more particularly ufed for that part of the inheritance which comes to the youngeft brothers.

Whatever the cadets, or younger brothers, poffefs of the father's eftate, they poffefs *ratione fratriagii*, and they are to do homage to the elder brother for it; in regard he is to do homage for the whole to the fuperior lord.

FRATRICELLI, in *Ecclefiaftical Hiftory*, an enthufiaftic fect of Francifcans, which rofe in Italy, and particularly in the marquifate of Ancona, about the year 1294.

The word is an Italian diminutive, fignifying fraterculi, or little brothers; and was here ufed as a term of derifion, as they were moft of them apoftate monks, whom the Italians call *fratelli*, or *fratricelli*.

For this reafon the term fratricelli, as a nickname, was given to many other fects, as the Catharifts, the Waldenfes, &c. however different in their opinions and in their conduct. But this denomination, applied to the auftere part of the Francifcans, was confidered as honourable. See FRANCISCANS.

The founders were P. Mauraro, and P. de Foffombroni, who having obtained of pope Celeftin V. a permiffion to live in folitude, after the manner of hermits, and to obferve the rule of St. Francis in all its rigour, feveral idle vagabond monks joined them, who, living after their own fancies, and making all perfection to confift in poverty, were foon condemned by pope Boniface VIII. and his fucceffor, and the inquifitors ordered to proceed againft them as heretics; which commiffion they executed with their ufual barbarity. Upon this, retiring into Sicily, Peter John Oliva de Serignan had no fooner publifhed this Comment on the Apocalypfe, than they adopted his errors.

They held the Romifh church to be Babylon, and propofed to eftablifh another far more perfect one; they maintained, that the rule of St. Francis was the evangelical rule obferved by Jefus Chrift, and his apoftles.

They foretold the reformation of the church, and the reftoration of the true gofpel of Chrift, by the genuine followers of St. Francis, and declared their affent to almoft all the doctrines which were publifhed under the name of the abbot Joachim, in the Introduction to the Everlafting Gofpel, a book publifhed in 1250, and explained by one of the fpiritual friars, whofe name was Gerhard. Among other enormities inculcated in this book, it is pretended that St. Francis was the angel mentioned in Rev. xiv. 6. and had promulgated to the world the true and everlafting gofpel of God; that the gofpel of Chrift was to be abrogated in 1260, and to give place to this new and everlafting gofpel, which was to be fubftituted in its room; and that the minifters of this great reformation were to be humble and bare-footed friars, deftitute of all worldly employments.

Some fay they even elected a pope of their new church; at leaft they appointed a general, with fuperiors, and built monafteries, &c. Befide the opinions of Oliva, they held, that the facraments of the church were invalid; becaufe thofe who adminiftered them had no longer any power or jurifdiction.

They were condemned afrefh by pope John XXII., in confequence of whofe cruelty they regarded him as the true antichrift; but feveral of them returning into Germany, were fheltered by Lewis, duke of Bavaria, the emperor.

There are authentic records, from which it appears, that no lefs than two thoufand perfons were burnt by the inquifition, from the year 1318 to the time of Innocent VI. for their inflexible attachment to the poverty of St. Francis. The feverities againft them were again revived towards the clofe of the fifteenth century by pope Nicholas V. and his fucceffors. However, notwithftanding all the perfecutions which this fect endured, they were not fufficient to extinguifh it; for it fubfifted until the times of the reformation in Germany, when its remaining votaries adopted the caufe, and embraced the doctrine and difcipline of Luther. And this has led the popifh writers to charge the fratricelli with many enormities, fome of which are recounted by M. Bayle, art. *Fratricelli.*

The fratricelli had divers other denominations; they were called fratricelli, according to fome, becaufe they lived in community, in imitation of the primitive Chriftians, or rather through the humility of the founder of the Francifcan order, to which the fratricelli originally belonged; *dulcini*, from one of their doctors; *bizochi*, *beguins*, and *beghardi*.

FRATRICIDE, of *frater*, *brother*, and *cædo*, *I kill*, the crime of murdering one's brother. See PARRICIDE.

Cain committed the firft fratricide; and the empire of Rome began with a fratricide.

FRATTA, in *Geography*, a town of Italy, in the duchy of Urbino; 32 miles S. of Urbino. N. lat. 43° 18'. E. long. 12° 18'.—Alfo, a town of Italy, in Friuli; 18 miles S.S.W. of Udina.

FRATTA, *La*, a town of Italy, in the Polefino de Rovigo, on the Scortico, containing about 6000 inhabitants.

FRAUBRUNNEN, or FRAUENBRUN, a town of Switzerland, and feat of a bailiwick, in the canton of Berne, deriving its name from a celebrated monaftery founded in the year 1246; 7 miles N. of Berne.

FRAUD, FRAUS, a fecret, underhand deceit, or injury, done to any one. See CHEATS and DECEIT.

To export or import goods by fraud, or fraudulently, is to do it by indirect ways, in order to avoid the paying of duty, &c. if they be permitted goods; or if they be contraband goods, to avoid the penalties adjudged by the laws.

A fraudulent conveyance of lands or goods to deceive creditors, or to defraud purchafers, is void in law; and the perfons juftifying or putting off fuch grants as good, fhall forfeit a year's value of the lands, and the full value of the goods and chattels, and likewife be imprifoned for half a year. Stat. 3 Hen. VII. c. 4. Stat. 50 Ed. III. c. 6. Stat. 13 Eliz. c. 5. made perpetual by ftat. 29 Eliz. c. 5. Stat. 27 Eliz. c. 4, made perpetual by ftat. 39 Eliz. c. 18. The feveral marks of fraud in a gift or grant of goods are the following: 1. If it be general, without exception of fome things of neceffity. 2. If the donor ftill poffeffes and ufes the goods. 3. If the deed be made in fecret. 4. If there be a truft between the parties. 5. If it be made while the action is depending. When a perfon is party to a fraud, all that follows thereupon will be intended to be done by him, though fraud fhall not be prefumed or adjudged to be fo, until it be found by a jury. 10 Rep. 56. All frauds and deceits, for which there is no remedy by the ordinary courfe of law, are properly cognizable in equity; and it is admitted, that matters of fraud were one of the chief branches to which the jurifdiction of chancery was originally confined. 4 Inft. 84.

Among a variety of cafes, in which relief has been given againft frauds, we may felect the following: Whenever fraud or furprife can be imputed to, or collected from the circumftances of the tranfaction, equity will interpofe and relieve againft it. It is faid, however, that it muft not be underftood, from cafes of this kind being generally brought into

into equity, that the courts of law are incompetent to relieve; for where the fraud can be clearly eftablifhed, courts of law exercife a concurrent jurifdiction with courts of equity, and will relieve by making void the inftrument obtained by fuch corrupt agreement or fraud. 1 Burr. 396. Wood's Inft. 295. Therefore, where the obligor was an unlettered man, and the bond was not read over to him, he was allowed to plead this circumftance in an action on the bond. 9 Hen. V. 15, cited 11 Co. 27 *b*.

So if the bond be in part read to an unlettered man, and fome of its material parts be omitted or mifreprefented. 2 Rol. Abr. 28. p. 8. It is obfervable that lord Coke, in the fame paffage where he confines the jurifdiction of courts of equity to fuch "frauds, covin, and deceit, for which there is no remedy by the ordinary courfe of law," feems to admit that all frauds were not relievable at law. See 3 Inft. 84. The chancery may decree a conveyance to be fraudulent, merely for being voluntary, and without any trial at law; yet it has been maintained, that fraud, or not, was triable only by a jury. Pre. Ch. 14, 15. Although courts of equity will not relieve againft agreements merely on the ground of the confideration being inadequate, yet if there be fuch inadequacy as to fhew, that the perfon did not underftand the bargain he made, or was fo oppreffed that he was glad to make it, knowing its inadequacy, it will fhew a command over him which may amount to a fraud. 2 Bro. C. R. 175. 1 Bro. C. R. 558. 2 Vez. 155. 2 P. Wms. 203. It feems agreed, tha if a woman, on the point of marriage, charge or convey her property to a mere ftranger, for whom fhe was not under even a moral obligation to provide, fuch conveyance will be deemed a fraud on the marital rights. 2 C. R. 41. 2 Vez. 264. If A. has a prior incumbrance on an eftate, and is a witnefs to a fubfequent mortgage, but does not difclofe his own incumbrance, this is fuch a fraud in him for which his incumbrance fhall be poftponed. 2 Vern. 151. 554. So if A. having a mortgage on a leafehold eftate, lends the mortgage deed to the mortgagor, with an intent to borrow more money; that is fuch a fraud in the mortgagee, for which his mortgage fhall be poftponed to the fubfequent incumbrance. 2 Vern. 726. 1 Eq. Abr. 321. If a fecurity be obtained from a perfon by fraud, upon a pretence of a demand that is fictitious, it will be relieved againft in equity. 2 Vern. 123. 632. There are likewife feveral inftances where a parol agreement intended to be reduced into writing, but prevented by fraud, has been decreed in equity, notwithftanding the ftatute of frauds and perjuries; as where upon a marriage-treaty, inftructions were given by the hufband to draw a fettlement, which he privately countermanded, and afterwards drew in the woman by perfuafions and affurances of fuch fettlement to marry him, it was decreed, that he fhould make good the fettlement. 1 Eq. Ab. 19. So where a parol agreement was concerning lending of money as a mortgage, and the covenants propofed were an abfolute deed from the mortgagor, and a deed of defeafance from the mortgagee, and after the mortgagee had got the deed of conveyance, he refufed to execute the defeafance; it was decreed againft him on the point of fraud. 1 Eq. Ab. 90.

The ftatute of frauds, 29 Car. II. cap. 3. requires that contracts and agreements, leafes, and devifes of land, be in writing. And devifes of land, rents, &c. are deemed fraudulent and void againft creditors, upon bonds or other fpecialties, 3 and 4 William and Mary, cap. 14. made perpetual by ftat. 6 William III. c. 14.

And every fuch creditor fhall have his action of debt upon his bonds and fpecialties againft the heir at law of fuch obligor, and fuch devifees jointly. This ftatute, however, excepts difpofitions for the payment of debts and raifing portions for children, in purfuance of marriage contracts made before marriage; it farther provides, that where any heir at law fhall be liable to pay his anceftor's debts, in refpect of lands defcended to fuch heir, and fhall alien the fame before action brought, fuch heir fhall be anfwerable to the creditor in an action of debt to the value of the land aliened; but the lands *bonâ fide* aliened before action brought fhall not be liable. Every devifee, however, made liable by the ftatute, fhall be chargeable in the fame manner as the heir, though the lands devifed fhall be aliened before action brought.

It may be laid down as a general rule, that without the exprefs provifion of any act of parliament, all deceitful practices in defrauding, or endeavouring to defraud, another of his known right, by means of fome artful device, contrary to the plain rules of common honefty, are condemned by the common law, and punifhable according to the heinoufnefs of the offence. Co. Litt. 36. Dyer 295. It is alfo a rule, that a wrongful manner of executing a thing fhall avoid a matter that might have been executed lawfully. Co. Litt. 35. 357. Rol. Abr. 420. 549. Poph. 64. 100. As to frauds in contracts and dealings, the common law fubjects the wrong-doer, in feveral inftances, to an action on the cafe; as if a perfon, having the poffeffion of goods, fell them to another, affirming them to be his own, when in truth they are not, an action on the cafe lies. 1 Rol. Abr. 90. Cro. Jac. 474. If on a treaty for the purchafe of a houfe, the defendant affirms the rent to be more than it is, whereby the plaintiff is induced to give more than the houfe is worth, this is a fraud. 1 Salk. 211. 1 Lev. 102. 1 Sid. 146. 1 Keb. 510. 518. 522. S. P.

FRAUDULENT Deeds. See Deed.

Fraudulent *Devifes*. See the article Fraud. See alfo Devise and Will.

FRAUENBERG, or Przinda, in *Geography*, a town of Bohemia, in the circle of Pilfen; 5 miles S. W. of Hayd.

Frauenberg, or *Hluboka*, a town of Bohemia, in the circle of Prachatitz; 12 miles S. E. of Woodnian.

Frauenberg, a town of Pruffia, in the province of Ermland, fituated on the Frifch-haff, built in the year 1279. The celebrated Copernicus was a canon of this church, and died here in 1543; 16 miles N. E. of Elbing. N. lat. 54° 20'. E. long. 19° 10'.—Alfo, a town of the duchy of Courland; 30 miles W. of Mittau.

FRAUENDORF, a town of Germany, in the bifhopric of Bamberg; 14 miles N. N. E. of Bamberg.—Alfo, a town of the New Mark of Brandenburg; 10 miles S. of Cuftrin.

FRAUENFIELD, a fmall town, or rather village of Switzerland, and neverthelefs the capital of the bailliage of Thurgau, containing fcarcely 1000 inhabitants; and only remarkable as the place where, fince 1712, the deputies of the Swifs cantons have been accuftomed to affemble at the general diet; 20 miles N. E. of Zurich.

FRAUENMARCK, a town of Hungary; fix miles N. E. of Levens.

FRAUENPRIESNITZ, a town of Germany, in Thuringia; 15 miles W. of Weimar.

FRAUENSTEIN, a town of Germany, in the circle of Erzgeburg, on the Mulda; 18 miles S. S. W. of Drefden. N. lat. 50° 43'. E. long. 13° 31'.

FRAUENTHAL, a town of the duchy of Stiria; 10 miles S. of Voitzberg.—Alfo, a town of the principality of Aufpach; five miles N. E. of Creglingen.

FRAU-

FRAUENWALD, a town of Germany, in the county of Henneberg; four miles N. E. of Schleufingen.

FRAUHOFEN, a town of Bavaria; three miles S. of Landfhut.

FRAUNBERG, a town of the duchy of Stiria; feven miles E. S. E. of Oberwoltz.

FRAUREUTH, a town of Germany, in the county of Reus; fix miles N. E. of Greitz.

FRAUS Legis; if a perfon, having no manner of title to a houfe, procure an affidavit of the fervice of a declaration in ejectment, and thereupon gets judgment; and, by virtue of a writ of *hab. fac. poffeffionem*, turns the owner out of poffeffion of the houfe, and feizes and converts the goods therein to his own ufe, he may be punifhed as a felon; becaufe he ufed the procefs of the law with a felonious purpofe, *in fraudem legis*.

FRAUSTADT, or Frauenstadt, in *Geography*, a town of the duchy of Warfaw, on the frontiers of Silefia, where, in the year 1706, the Saxons were defeated by the Swedes. It contains three proteftant churches, and is chiefly inhabited by Germans, who trade principally in cattle and wool; 170 miles N. N. W. of Breflaw.

FRAXINELLA, in *Botany*, the diminutive of *Fraxinus*, a little afh, alluding to the form of the leaves. See Dictamnus.

Fraxinella, in the *Materia Medica*, is the Dictamnus *albus*, which fee. The root, which is the only part directed for medicinal ufe, has, when frefh, a moderately ftrong, not difagreeable fmell; and to the tafte difcovers a pretty ftrong and very durable bitternefs, which is taken up by both watery and fpirituous menftrua; and on infpiffating the filtered tinctures, remains entire in the extracts; the aqueous extract is in much larger quantity than the fpirituous, and proportionably weaker in tafte. This root was formerly ufed as a ftomachic, tonic, and alexipharmic, and was fuppofed to be an efficacious medicine in removing uterine obftructions, and deftroying worms; but it funk almoft entirely into difufe, till Baron Stoerck brought it into notice by publifhing feveral cafes of its fuccefs in tertian intermittents, worms, (lumbrici,) and menftrual fuppreffions; in which cafes he employed the powdered root to the extent of a fcruple twice a day. He alfo ufed a tincture, prepared of two ounces of the frefh root digefted in 14 ounces of fpirit of wine; of this 20 to 50 drops, two or three times a-day, were fuccefsfully prefcribed in epilepfies, &c. and when joined with fteel, this root, it is faid, was of great fervice to chlorotic patients. Neverthelefs, though the dictamnus is a medicine of confiderable power, we may ftill fay with Haller, "Nondum autem vero pro dignitate exploratus eft." Woodville, Med. Bot.

FRAXINUS, in *Botany*, the Afh; fo called by the Romans, whether from φράσσω, to hedge in or enclofe, or from *fragofus*, rough and rocky; the former alluding to its poffible, though not general, ufe, and the latter to its occafional, though not ufual, places of growth; we really cannot decide, but we have nothing better to offer. Linn. Gen. 550. Schreb. 736. Sm. Fl. Brit. 12. Mart. Mill. Dict. v. 2. Ait. Hort. Kew. v. 3. 444. Juff. 105. Tourn. t. 343. Gærtn. t. 49. Clafs and order, *Diandria Monogynia*. (*Polygamia Dioecia*; Linn.) Nat. Ord. *Sepiariæ*, Linn. *Jafmineæ*, Juff.

Gen. Ch. *Cal.* either wanting, or a fmall Perianth of one leaf, in four deep fegments, upright and acute. *Cor.* either wanting, or in four long, linear, acute, upright fegments. *Stam.* Filaments two, erect, much fhorter than the corolla; anthers erect, oblong, with four furrows. *Pift.* Germen inferior, ovate, compreffed; ftyle cylindrical, upright; ftigma thickifh, cloven. *Peric.* Capfule ovate-oblong, leafy in the upper part, of two cells, one of which is generally abortive. *Seeds* folitary, pendulous, lanceolate, compreffed, cloathed with fhining powder.

Eff. Ch. Calyx none, or deeply four-cleft. Corolla none, or deeply four-cleft. Capfule fuperior, of two cells, leafy at the top, compreffed. Seeds folitary, pendulous. Some flowers have no ftamens, fome no ftigma.

E. *excelfior* has neither calyx nor corolla. Its flowers have always a greater or lefs proportion of female ones intermixed.—*F. Ornus*, though afferted by Linnæus to bear perfect or united flowers only, was found by Sibthorp to have fome few with an abortive germen and no ftyle, and ftill more with a perfect piftil, but no ftamens.

1. F. *Ornus*. Manna, or Flowering Afh. Linn. Sp. Pl. 1510. Sm. Fl. Græc. Sibth. v. 1. 4. t. 4. Woodv. Med. Bot. t. 36. Willd. Baumz. 115. Ehrh. Pl. Off. 270. Arb. 160. Leaflets elliptic-oblong, pointed, bluntly ferrated. Flowers with a corolla.—Native of the warmeft parts of Europe. Common on the higheft moft rocky mountains of Greece, and not rare in the fouth of Italy. This is the μελια of the ancient Greeks, μέλεος of the modern inhabitants of the fame country. Manna is obtained from the fap that flows from wounds in the trunk, and according to the information of Mr. Hawkins, recorded in the Flora Græca, is collected at prefent in the peninfula of Mina only. The tree is fometimes feen in our fhrubberies, and in May or June, when covered with its innumerable light delicate whitifh bloffoms as with a muflin veil, affords a very agreeable fpectacle. The *leaves* confift of two or three pair, with an odd one, of oppofite, flightly ftalked, leaflets, various in breadth, fmooth, light green; their ferratures fmall, rounded, numerous and obtufe. *Panicles* about the ends of the branches, axillary, much-compounded, many-flowered. *Capfules* fmaller than thofe of the common afh, feldom ripened in England.

2. F. *rotundifolia*. Round-leaved Afh. Mill. Dict. ed. 8. n. 2. Ait. Hort. Kew. v. 3. 445. Lam. Dict. v. 2. 546. Willd. Baumz. 116. t. 6. f. 1.—Leaflets roundifh, acute, fharply ferrated. Flowers with a corolla.—Native of the Levant. Manna feems to be collected from this indifferently with the preceding. It is known by the fharp fpreading ferratures of the *leaflets*. Their breadth or roundnefs is a variable circumftance in the former, and poffibly in the prefent fpecies. Miller makes a whimfical miftake in terming the flowers *coloured*, from a wrong tranflation, and indeed a wrong tranfcript, of the words *floribus corollatis* in Linnæus. Plukenet's *F. alepenfis*, Phyt. t. 182. f. 4, feems manifeftly this fpecies, as Lamarck makes it, though Willdenow refers it to *parvifolia*, n. 9.

3. F. *americana*. American Afh. Linn. Sp. Pl. 1510. Willd. Baumz. 116. (F. acuminata; Lam. Dict. v. 2. 547.)—Leaflets ftalked, oblong, pointed, flightly ferrated; glaucous beneath. Capfules cylindrical at the bafe.—Native of Carolina, Pennfylvania, &c.—The taper-pointed *leaflets*, very flightly ferrated, glaucous beneath, and of an oblong lanceolate figure, diftinguifh this fpecies. The *capfules* are remarkable for being fcarcely at all compreffed, but nearly cylindrical, in the part where the feed is lodged. A jagged permanent *calyx* is vifible on the fruit, which leads us to fuppofe it has alfo a *corolla*, but of that we have no account. This afh is faid to thrive in moift low fituations. It grows to a confiderable height, and makes a handfome tree.

4. F. *juglandifolia*. Walnut-leaved Afh.—Lam. Dict. v. 2. 548. Willd. Baumz. 117.—"Leaflets ftalked, ovate, opaque, toothed; glaucous, with downy veins beneath. Branches fmooth. Flowers with a calyx."—Native of North

North America. It bloſſoms at the end of April or beginning of May, and is a middle-ſized tree, not remarkable for beauty. The *leaves* are large, reſembling thoſe of a Walnut, and differ from the laſt in being toothed, and not ſo much pointed. The *buds* are ſmall, compreſſed and reddiſh. The *flowers* have a calyx, but we find no mention of a corolla. *Lamarck*, *Willdenow*.

5. F. *caroliniana*. Narrow-leaved Carolina Aſh.—Lam. Dict. v. 2. 548. Willd. Baumz. 119. (F. carolinenſis, foliis anguſtioribus, utrinque acuminatis, pendulis; Cateſby's Carolina, t. 80?)—"Leaflets ſtalked, lanceolate, toothed, ſhining, ſmooth. Branches ſmooth. Flowers with a calyx."—Native of North America. Differs from the preceding in having narrower, more pointed *leaves*, not white beneath, toothed, of a bright ſhining green. Lamarck deſcribes a variety with ſtill narrower leaves, of a brighter green beneath, and of an agreeable aſpect, which he conceives to be probably what Cateſby has figured.

6. F. *pubeſcens*. Downy-leaved Aſh.—Lam. Dict. v. 2. 548. Willd. Baumz. 119. Walt. Carol. 254?—"Leaflets ſtalked, elliptic-ovate, ſerrated; downy beneath, as well as the footſtalks and branches. Flowers with a calyx."—A *tree* twenty feet high, of little beauty, native of North America. The leaflets are rather more numerous than in any of the other American kinds, being uſually ſeven or nine, finely ſerrated, clothed underneath with ſoft down. The *footſtalks* and young *branches* are likewiſe downy. *Flowers* with a calyx, but no corolla. *Lamarck*, *Willdenow*.

7. F. *ſambucifolia*. Elder-leaved Aſh.—Lam. Dict. v. 2. 549. Willd. Baumz. 121.—"Leaves ſeſſile, ovato-lanceolate, ſerrated, rugged, ſhining; branchings of their veins downy beneath."—Native of North America. A *tree* of vigorous growth, twenty or twenty-five feet high, known by its ſeſſile *leaflets*, and their dark-green colour. The terminal one only is ſtalked. The whole number of leaflets is ſeven. They are naked, except the ribs at the back. Of the flowers we have no account.

Of this and the three immediately preceding we have no knowledge but from the works of Lamarck and Willdenow. The former ſaw them growing in the garden at Paris. They may perhaps all be to be found among our nurſeries in England, but botaniſts have not taken the pains to ſtudy them. As ſo much has been done to clear up the far more difficult genera of *Salix* and *Pinus*, it is to be hoped thoſe of *Fraxinus* and *Quercus* will one day receive elucidation, from ſome ſcientific hand. The plants muſt be obſerved, and ſpecimens collected, when in flower, in early and in full-grown foliage, with the fully formed capſules.

8. F. *excelſior*. Common Aſh. Linn. Sp. Pl. 1509. Lam. Dict. v. 2. 544. Engl. Bot. t. 1692.—Leaflets ſlightly ſtalked, elliptic-lanceolate, pointed, ſerrated. Flowers without calyx or corolla.—Native of Europe and the north of Aſia, in a light ſpringy (but not marſhy) ſoil, eſpecially if marly or calcareous. When planted in bogs, it contributes much to drain them. It will grow in almoſt any ſituation, even in hard clay and dry gravel, though Lamarck juſtly obſerves that poor dry ſandy ground is fatal to this tree. Its ſmooth ſtately *ſtem* riſes to a great height, with ſpreading, rather drooping, branches. *Buds* ſhort, thick, black and downy. *Leaves* compoſed of five or ſix pair of nearly ſeſſile, ovate, or ovato-lanceolate, pointed, ſerrated, ſmooth leaflets. The *flowers* come forth in April, before the leaves, from lateral buds, below the leaf-buds, and are greeniſh and inconſpicuous, without any traces of calyx or petals. *Capſules* pendulous, compreſſed, often twiſted, pointed.

a. Weeping Aſh. This is a variety, whoſe branches are quite pendulous, and ſweep on the ground. It is well adapted for bowers, and is now common in the gardens of this country.

b. Simple-leaved Aſh. Fraxinus ſimplicifolia; Willd. Baumz. 121. t. 3. f. 2. We have heard of wild plants of this kind in Cambridgeſhire and in Kent. The large ſimple *leaves* give it a totally different aſpect from the Common Aſh, but have rather ſingularity than beauty to recommend them. Some of them however are occaſionally pinnate. Willdenow eſteems this Aſh a diſtinct ſpecies, and we have heard ſurmiſes to the ſame purpoſe, which we have not yet materials to refute or confirm. Propagation by ſeed ſhould decide the queſtion.

F. *excelſior* is valuable for its tough and hard wood, which ſerves for many different purpoſes. The varieties are propagated by grafting.

9. F. *parvifolia*. Small-leaved Aſh. Lam. Dict. v. 2. 546. Willd. Baumz. 124. t. 6. f. 2. (F. rotundifolia; Ehrh. Pl. Off. 280.)—Leaflets ſlightly ſtalked, ovate, pointed, ſerrated; wedge-ſhaped at the baſe. Flowers without calyx or corolla. Capſules cylindrical at the baſe.—Native of the Levant. This has been confounded with the Manna Aſh, from which it is very diſtinct, being much more like the Common Aſh in its *buds*, and agreeing with the latter in the colour and ſtructure of its *flowers*, which have neither calyx nor corolla. The *capſules*, according to Lamarck, are narrow, and nearly cylindrical, their wing dilated upwards, and abrupt. The *leaflets* are ſhorter and broader than in *F. excelſior*. Ehrhart appears to have confounded the ſpecies before us with Miller's *F. rotundifolia*, our n. 2, and ſeveral perſons miſtake it for the tree which produces Manna, F. *Ornus*, n. 1.

Fraxinus, in *Gardening*, compriſes plants of the hardy deciduous tree kind, of which the ſpecies cultivated for timber are: the common aſh-tree (F. excelſior), the manna aſh-tree (F. rotundifolia), the flowering aſh-tree (F. ornus), and the American aſh-tree (F. americana).

Of the firſt ſort there are varieties, with ſimple leaves, lobed, and even ternate; with pendulous branches; or weeping aſh, with variegated leaves, yellow and white; or gold-ſtriped and ſilver-ſtriped.

And of the third ſort there is a variety, the dwarf flowering aſh.

Of the fourth ſort there are the white American aſh, and the red American aſh. And there is a third variety named the black aſh, in which the ſtem is erect, branching, twenty or thirty feet in height, with large very dark leaves compoſed of three or four pairs of lobes and an odd one, ſmall flowers of a greeniſh colour, and broad blackiſh fruit. Other varieties may alſo be found in the nurſeries which are not leſs curious than thoſe that have been mentioned above.

Method of Culture.—Theſe plants may all of them be increaſed with facility by ſeeds, which in the common ſort ſhould be ſown in the autumn; and in the others, as ſoon as they can be obtained in the ſpring, on beds of light mould over the ſurface, raking them into the depth of nearly an inch. The young plants ſhould be afterwards kept clear from weeds, and when they have had one or two years growth they ſhould be removed into nurſery rows, and placed two feet aſunder, and one diſtant in the rows, where they muſt remain till fit for being planted, where they are to grow in the natural ground.

The three laſt ſorts may likewiſe be raiſed by budding or ingrafting upon common aſh ſtocks, when of the ſize of a good bean ſtem. This buſineſs ſhould be performed about the

the latter end of fummer; but the plants raifed in this mode are not fo fine as thofe from feed, on account of the ftocks growing with more rapidity than the heads of the plants.

Thefe are the only methods by which the variegated varieties can be increafed.

All the forts may be introduced as ornamental trees; but thofe of the American kind are the moft proper in fmall plantations, fhrubberies, and other ornamented grounds.

The firft fort is highly ufeful as a timber-tree, and fhould be much more attended to than has lately been the cafe, as wood of the afh kind is becoming extremely fcarce in many fituations. For various ufes in hufbandry, and feveral other purpofes, there is no other fort of wood that can fupply its place. It grows well in dry places where the foil is mellow, though it may not have any great depth, but fucceeds beft in fouthern expofures. See Ash-*tree*.

FRAY literally fignifies to fret; as cloth or fluff does by rubbing, or over-much wearing.

Among hunters a deer is faid to fray his head, when he rubs it againft a tree, to caufe the fkins of his new horns to come off.

FRAYLES, in *Geography*, an ifland near the coaft of New Andalufia, in Terra Firma.

Frayles, *Los*, a clufter of fmall iflands in the Weft Indies, about 6 miles N.E. from the ifland of Margarita. N. lat. 11° 15'. W. long. 63° 46'.

FREA, Freia, or *Frigga*, in *Mythology*, the wife of Odin, and, next to him, the moft revered divinity among the heathen Saxons, Danes, and other northern nations. As Odin was reputed to be the father, Frea was efteemed the mother of all the other gods. In the moft ancient times, Frea was the fame with the goddefs Hertha, or Earth, which was devoutly worfhipped by the Angli and other German nations. See Hertha and Odin. From the name of this divinity, fome have derived that of Friday, the fixth day of the week.

FREAM, in *Agriculture*, a term applied to fuch arable or ploughed land as is worn out or exhaufted, and is laid fallow till it recovers.

Fream, among *Sportfmen*, a term ufed for the noife of a boar in rutting time.

FRECHILLA, in *Geography*, a town of Spain, in the province of Leon; 17 miles N.W. of Palencia.

FRECKELBEN, a town of Germany, in the principality of Anhalt-Deffau; 30 miles W.S.W. of Deffau.

FRECKLE, in *Agriculture*, a term applied to fuch wheat and other crops as are fpotted by a fort of mildew in the ftraw, &c. See Mildew.

Freckles, in *Medicine*, fmall brown or dufky fpots, which are fprinkled on the fkin, efpecially of the face, neck, hands, and fuch parts as are expofed to the fun and air. They are moft frequent in women, and efpecially in thofe of fair complexion, with red or auburn hair. They occur in various degrees as to fize and denfity, but are never productive of any inconvenience. In fome perfons they appear only during the fummer, and difappear with the return of cold weather; but in others they are permanent. The Latins denominated them *lentigines*, from their fancied refemblance to lentils; the Germans call them *fommerfproffen*, and *fommerflecken*, from the appearance in hot weather; by the French they are termed *rouffeurs;* and *roffore* and *lentigine* by the Italians. The humoral phyficians found an eafy explanation of the origin of freckles, in the depofition of the oily, or bilious portions of the fluids in the fkin, in confequence of the evaporation of the thinner parts, which the fummer heat was fuppofed to occafion. But as neither oil, nor bile, nor "fuliginous vapour" (as Turner fuppofes) exift in the blood, thefe hypothefes are mere abfurdities. In truth, we are equally ignorant of the nature of thefe cutaneous fpots, as of the means of removing them when formed. Various diftilled waters, as of elder-flowers, bean-flowers, &c.; infufions of thefe flowers in goat's milk, alum, the preparations of lead, &c. have been recommended by different writers, as efficacious in the removal of freckles; but we believe their remedial powers to be purely imaginary. As the freckles appear only on parts expofed to the air and light, the moft obvious means of preventing or removing them muft confift in excluding the operation of thofe agents upon the fkin as much as poffible. See Sennert. Opera, lib. v. p. iii. § i. cap. iii. Turner on the Skin.

FREDDO, in *Geography*, a river of Sicily, in the valley of Demona, which runs into the fea.—Alfo, a river of Calabria, which runs into the fea. N. lat. 39° 18'. E. long. 16° 15'.

FREDEBURG, a town of Germany, in the kingdom of Weftphalia; 52 miles E. of Cologne.

FREDEGAIRE, in *Biography*, the moft ancient of the French hiftorians, flourifhed in the feventh century. Of his hiftory nothing is known. He compofed a chronicle in five books, containing a chronological hiftory from the creation to the fourth year of Clovis II. which has been continued by other authors to the year 768. It is very defective as a hiftory, but is indifpenfible in the account of three of the early kings. Moreri.

FREDEGONDE, a woman famous in the early period of French hiftory, was defcended from an obfcure family in Picardy. She entered into the fervice of Audouaire, firft wife of Chilperic I., king of France, and procured her divorce. Chilperic then married Galfuintha, daughter of the Vifigoth king of Spain, who was foon after found dead in her bed. About the year 568 he raifed Fredegonde to the throne. In this high fituation fhe ufed her power to the worft purpofes: fhe caufed Sigebert, brother of Chilperic, to be affaffinated in the midft of his army. She afterwards brought to a like end Merovee, the fon of Chilperic by his firft wife. A venerable bifhop of Rouen was her next victim, whom fhe caufed to be ftabbed at the altar. Refolved to make the way clear for her own children, fhe contrived the death of Clovis, younger brother of Merovee, which was followed by that of their mother Audouaire. There feemed no end to her cruelty, till at length her temper was fomewhat affected by the lofs of three of her own children by an epidemic diftemper, and fhe then perfuaded the king to repeal fome oppreffive impofitions laid upon his fubjects. In 584 Chilperic himfelf was affaffinated by an unknown hand, but the fufpicion fell on Fredegonde, whofe criminal paffion for another perfon, the king is faid to have detected. Fredegonde being now driven from the throne, fled with her remaining fon, Clotaire II., then an infant, and took refuge at the court of the king of Burgundy, whom fhe found means to intereft in her favour. An attempt was made by Childebert to poffefs himfelf of the eftates of young Clotaire, but his mother raifed troops, put herfelf at their head, gained a victory, and triumphed over her enemies. She died in 597, leaving the affairs of her fon in good condition. Moreri.

FREDELAND, in *Geography*, a town of Pruffia, in Pomerania; 60 miles S.S.W. of Dantzic.

FREDENSBORG, a town of Denmark, in the ifland of Zealand; 18 miles N. of Copenhagen. N. lat. 55° 59'. E. long. 12° 25'.

FREDENWALDE, a town of Brandenburg, in the Ucker

Ucker Mark; 40 miles N. of Berlin. N. lat. 53° 7'. E. long. 13° 50'.

FREDERIC I. furnamed *Barbaroffa*, in *Biography*, emperor of Germany, born in 1121, was the fon of Frederic duke of Swabia, and fucceeded his uncle Conrad III. on the imperial throne in 1152. His enterprifing and martial difpofition led him to affert all the prerogatives claimed by the German empire. Soon after he came to the crown he fettled a difpute between two rivals for the crown of Denmark, and obliged Sueno, the fuccefsful one, to do him homage. To fhew his independence on the pope, with whom he began to have difputes, he repudiated, by his own authority, his wife Adelaide, on account of confanguinity. The troubles of Italy called him into that country in 1155, where he received the fubmiffion of moft of the Italian great lords and cities. At Pavia he was crowned king of Italy, and had an interview with pope Adrian IV. to whom he paid homage. He then re-eftablifhed the pontiff in Rome, whence he had been expelled by a tumult, received the imperial crown from his hands, and then returned to Germany, and called a diet at Befançon. The pope's legates, who attended this meeting, gave fo much offence by reading a letter from him, in which he pretended that he had conferred the empire upon Frederic by his own free grace, that they were driven out with ignominy and contempt, and the emperor publicly gave the lie to the pope's affertions. This difpute was compromifed, and Frederic reduced to obedience Boleflaus, duke of Poland, who had afferted his independence. Having pacified Germany, he proceeded again into Italy with a powerful army. Here he invaded the republics of Lombardy with the arts of a ftatefman, the valour of a foldier, and the cruelty of a tyrant. "The recent difcovery of the pandects," fays the hiftorian, "had renewed a fcience moft favourable to defpotifm; and his venal advocates proclaimed the emperor the abfolute mafter of the lives and properties of his fubjects." He every where arrogated the rights of unlimited fovereignty, and carried fire and fword through thofe places which ventured upon oppofition. On the death of Adrian IV. there was a violent fchifm with regard to a fucceffor, and the emperor was excommunicated by Alexander III. who had been chofen pope by the cardinals. Frederic in revenge made himfelf mafter of Milan in 1163, and gratified his refentment by razing the city to the ground, fparing nothing but the churches. Thefe fevere examples put an end to all farther oppofition in Lombardy, and he returned to Germany, and fet out to meet Lewis the Young, king of France, at a council to be held for terminating the papal fchifm, but it proved ineffectual. He was obliged again to crofs the Alps to punifh his enemies, and upon his return to Germany pope Alexander was efcorted to Rome by the king of Sicily, and took poffeffion of his fee. Frederic revifited Rome, and the pope thought it prudent to efcape in the habit of a pilgrim to Beneventum. The antipope was now feated in his chair, and he crowned the emperor with his emprefs Beatrice. His fuccefs was of fhort duration, for the plague made fuch ravages in the army that he was obliged to make a rapid retreat. With the utmoft difficulty he reached Alface with the wreck of his army, while the confederates in Lombardy ftrengthened themfelves, and pope Alexander received fuccours from the Greek emperor Manuel. Frederic appeafed the diforders of Saxony, where the nobles had taken up arms againft their duke, and procured the election of his eldeft fon Henry to the dignity of king of the Romans. He again marched into Italy, reduced feveral towns, till at length fortune feemed to turn againft him, and he was totally defeated in a battle at Signano; and about the fame time his fon Henry was defeated in a fea-fight with the Venetians, and taken prifoner. The caufe of Frederic now in Italy was fuch, that he propofed an accommodation with pope Alexander. They had an interview at Venice in 1177. The emperor was very humble before his holinefs, who abfolved him from all ecclefiaftical cenfures, and communicated with him. This reconciliation produced the treaty of Conftance, in which Frederic confirmed the freedom of twenty-four cities with a refervation of his rights as fovereign. In 1183 the treaty of Placentia confirmed the agreement made between the emperor and the Lombard towns. Neverthelefs, new troubles were perpetually arifing from fources frequently unexpected: twice on the emperor's rejecting the popes' Lucius III. and Urban III. the fovereignty of the countefs Matilda's eftates, called St. Peter's patrimony. He feized the greater part of this property, and by the marriage of his fon Henry with the heirefs of William king of Sicily, fo far ftrengthened his intereft in Italy, that the popes, though they had many caufes of complaint againft him, were afraid to proceed to extremities. At length the news of the capture of Jerufalem by Saladin fufpended domeftic quarrels among the Chriftians, and the emperor, as firft prince of Chriftendom, took the crofs in 1188, with his fon Frederic, and a number of the principal nobles of Germany. Affembling an army of 160,000 men in the plains of Hungary, he proceeded to the territories of the Greek emperor, who did all in his power to impede their march, fo that Frederic was compelled to act againft him as an enemy, and to make his way by force. With a reduced army he reached the Turkifh frontier, took the city of Iconium, croffed mount Taurus, and was proceeding in the career of victory, when Frederic, tempted by the great heat of the climate to bathe in a river of Cilicia, was carried away by the current and drowned. The enterprize in which he had engaged would probably have proved fatal, even had he efcaped this misfortune, for his fon and the greateft part of his army afterwards perifhed of a peftilential difeafe before the walls of Acre. Frederic died in 1190 in the fixty-ninth year of his age. Befides the vigour and capacity which he difplayed in action, Frederic poffeffed fome literary talents, and drew up memoirs of his own life, which he gave to Otho the hiftorian. Gibbon. Univ. Hift. Moreri.

FREDERIC II. grandfon of the preceding, and fon of the emperor Henry VI. by Conftance of Sicily, was born in 1194. He was created king of the Romans in his cradle, but the premature death of his father prevented his fucceffion at the firft vacancy. He was educated with great care by his mother, and acquired the Greek, the Latin, German, French, and Turkifh languages. He afcended the throne when he was about eighteen years of age, in the full poffeffion of thofe accomplifhments which are expected to give luftre to a diadem, and to render a nation happy. His hereditary poffeffions were very confiderable, including the kingdoms of Naples and Sicily, the dukedom of Swabia, and other German territories. When the emperor Otho was excommunicated by the pope, Frederic was declared emperor, and became peaceable poffeffor of the imperial throne by the retreat and death of Otho. He was folemnly crowned at Aix-la-Chapelle in 1215. As an acknowledgment of the favours which divine Providence had hitherto beftowed upon him, he made a vow to go in perfon to the Holy Land. The firft four years of his reign having been fpent in arranging the affairs of the empire, and curbing the rebellious fpirit of Otho's adherents, he made a progrefs into Italy in the fummer 1220, and received the imperial crown from Honorius III. He alfo caufed his fon Henry to be declared king of the Romans, and promifed upon oath that he would

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lead an army into Afia, at any time his holinefs fhould appoint. He was, however, fo tardy in the execution of his vow, that Honorius threatened to excommunicate him: a rupture enfued, which threatened very ferious confequences, for the emperor not only remonftrated with the pope, but publifhed a fevere manifefto for the juftification of his own conduct, and ordered his troops to march to the frontiers of the ecclefiaftical ftate. Honorius now perceived the rafhnefs of his own conduct, apologized, and a reconciliation took place, in which Frederic agreed to marry Yolanda, daughter of the king of Jerufalem; and promifed to fet out with an army in two years for the recovery of Paleftine. Notwithftanding thefe renewed engagements, Frederic ftill hefitated to take the crofs: Honorius again remonftrated, and a literary correfpondence commenced, in which he accufed the emperor of ingratitude and cruelty to his father-in-law, who had ceded his title to the kingdom of Jerufalem. On the death of Honorius, and the elevation of Gregory IX. to the apoftolic chair, Frederic avowed his intention of performing his engagement, and actually fet fail, with a powerful armament; but about three days after he had put to fea, a flight indifpofition ferved as an excufe for his return. The pope now without hefitation excommunicated him, and fuch commotions enfued, that Frederic thought proper to fet out immediately for the Holy Land, but as he did not carry with him the pope's abfolution, he was coldly received at Jerufalem; the crufaders peremptorily refufed to acknowledge him as their chief, and he concluded a treaty with the Saracens. He then caufed himfelf to be crowned at Jerufalem, and returned to Naples with a title which has fince been preferved by the Sicilian monarchs. Frederic now employed himfelf in attempting to reduce the revolted cities in Lombardy; but while thus engaged, his fon Henry, king of the Romans, formed a confederacy againft him, which obliged him to vifit Germany. A diet was held at Mentz, in which his fon was convicted of rebellion, and was in confequence fent to Sicily; but upon frefh confpiracies being detected, he was made clofe prifoner in the caftle of Apulia, where he foon after died. He then invaded the dominions of the duke of Auftria, his fon's accomplice, took Vienna, where he founded the univerfity, and procured the election of his fon Conrad as king of the Romans. After this he returned to Italy with a powerful army, gained a confiderable victory over the Lombard league, and became fo formidable, that the pope openly took part againft him, and renewed his excommunication. A moft fatal war fucceeded, which fpread through Italy, and in the courfe of which almoft every town was ravaged by the hoftile armies. Gregory died; but his fucceffor, pope Innocent IV., continued the quarrel, and excommunicated the emperor in 1245. The pope's party being triumphant, they elected a new king of the Romans; an attempt was made to poifon the emperor, but it was rendered abortive by a timely difcovery. At the fiege of Parma, undertaken by Frederic, he met with a total defeat, which caufed his party to be almoft entirely difperfed in the north of Italy. He was now obliged to retire to the kingdom of Naples, where he died of a fever in the fifty-fifth year of his age, and thirty-fourth of his reign. Frederic II. appears to have been a prince of great courage, genius, and fortitude; but his more fplendid qualities were tarnifhed by ambition, violence, and an inordinate attachment to the fair fex. He married fix wives, of whom the laft was daughter of John king of England. He was addicted to the follies of judicial aftrology, and though he has been charged with maintaining atheiftical tenets, yet as the charge was made through the medium of the popes, with whom he was perpetually at variance, it is fcarcely to be relied on. He was unqueftionably a patron of learning, and caufed the works of Ariftotle and others of the ancients to be tranflated from the Greek and Arabic into Latin. He himfelf compofed poems, and fome profe works, and he is faid to have had a fhare in the famous treatife "De tribus Impoftoribus." It was a fundamental maxim of his conduct, never to poftpone any bufinefs till to-morrow which he could poffibly perform in the current day. Moreri. Univ. Hift.

Frederic III., emperor, fon of Erneft, duke of Auftria, fucceeded his coufin Albert II. in the year 1440. He was now in his twenty-fifth year, and one of his firft acts was to convoke a diet for the purpofe of terminating the fchifms then fubfifting in the papal fee, but as his propofitions were totally difregarded, he left the matter to the contending popes to fettle as they pleafed. In 1451 Frederic vifited Italy in order to receive the imperial crown from the pope. This ceremony was performed with due pomp, but did not enable him to recover any of the rights of the empire which had been torn from it by various ufurpers, and his vifit left a very unfavourable impreffion of his talents on the minds of the Italians. An attempt was made to roufe him to exertion when Conftantinople was taken by the Turks, but he could not be prevailed on to make any efforts in the Chriftian caufe. He was engaged fome time in domeftic wars for the poffeffion of the duchy of Auftria, which on the death of Albert he obtained. In 1468 he vifited Rome, held feveral conferences with the pope concerning means for refifting the progrefs of the Turks; but nothing of importance followed. Frederic was, however, very intent upon the aggrandizement of his family, and the marriage of his fon Maximilian to the heirefs of the rich houfe of Burgundy, and thus had the good fortune to be the author of the greateft acceffion of dominion that his race ever acquired. From this period he repofed upon Maximilian the chief weight of the government, who was foon after elected king of the Romans. Upon the death of Matthias he obtained from his fon Ladiflaus the reftitution of Auftria, and afterwards regained Tyrol from the duke of Bavaria; at length he quitted the reins of empire, and retired to Lentz, where he occupied himfelf in fcientific ftudies. He died at the age of feventy-nine years, in confequence of an amputation of his leg. He was a prince of an agreeable air and majeftic countenance: he was plain in his apparel, moderate in his paffions, and fo remarkably abftemious, that his life is faid to have refembled a continual faft. From his natural averfion from war he was furnamed the "Pacific," yet the inconftancy of his temper often prompted him to embark in quarrels. He was endowed with a remarkably tenacious memory, but was deftitute of courage, refolution, and generofity. He had a favourite maxim to which he had perpetual recourfe, *viz.* "that the beft remedy for irretrievable loffes is oblivion." Moreri. Univer. Hift.

Frederic I., king of Denmark, was born in 1473, and fucceeded to the throne on the abdication of his nephew Chriftian II. At a general diet of the Danes, convoked for the purpofe, he was declared king, and the ftates of Norway likewife proclaimed him monarch with the ufual formalities. Being of an ambitious and afpiring mind he was anxious for reuniting the three kingdoms, and for that purpofe wrote to fome of the principal nobility of Sweden; but Guftavus Vafa was capable of defending the crown that was firmly fixed on his head, and therefore Frederic readily gave up his claims, and formed a treaty of alliance with that monarch. The ifle of Gothland, feized by admiral Norby, was afterwards the object of contention between the two

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crowns; but Frederic, by his vigour and policy, finally annexed it to his dominions. The progrefs of the reformation in the laft reign had brought religious differences to a crifis in Denmark, and, 1527, Frederic openly declared in favour of Lutheranifm: while, however, he gave the afcendancy to that perfuafion, he determined that every fubject of his dominions fhould be at liberty to embrace either the doctrines of Luther or of Rome; that no perfon fhould be perfecuted or molefted on account of his religion, and that the religious of all denominations fhould be permitted to marry: in confequence of this wife and truly liberal decree, the abbeys and cloifters were deferted, all aufterities difregarded, and Lutheranifm was every where publicly preached and embraced. The depofed Chriftian II. in 1531 made an attempt for the recovery of his crown, but being defeated in his object, he was obliged to furrender himfelf prifoner, and was committed to clofe cuftody by his uncle. Frederic I. died, after a reign of ten years, at the age of fixty. His conduct obtained him the title of "Pacific," and contemporary hiftorians juftly praife the prudence and moderation of his government, which rendered his reign profperous and happy. At his death the clergy, who had been offended at his innovations, were left in a ftate of uncertainty, in confequence of which the proteftant religion gained ground and gathered ftrength. Frederic left children by both his wives, one of whom was the daughter of the elector of Brandenburg, the other of the duke of Pomerania. Univer. Hift. Moreri.

Frederic II., king of Denmark, fon of Chriftian III., was born in 1534, and fucceeded to the throne on the death of his father in 1558. The firft years of his reign were paffed in the din of war, with the people of Dithmarfh, who had made themfelves independent, but who, after a brave refiftance, were forced to fubmit to the law of the conqueror: he next engaged in a conteft with Eric king of Sweden, whofe embaffadors, as they were paffing into Germany, he arrefted in violation of the fafe conduct he had granted them. This war was commenced in 1563, and was carried on with mutual detriment, and the moft cruel devaftations of both countries, till the depofition of Eric by his own fubjects in 1568. Peace was then made, but upon terms fo unfavourable to Sweden that war was renewed in 1569. The Hanfeatic towns, which were claimed by both parties, took an active part in the hoftilities, and the city of Lubec embraced the occafion of revenging itfelf on Sweden for the many reftrictions impofed upon it, and upon the commerce of the city. They concluded a treaty with the king of Denmark, and joined his fleet with a powerful fquadron. After this, Frederic held the balance between thofe commercial towns, and interefted himfelf more than his predeceffors in acquiring an influence over the affairs of Europe. He rendered commerce flourifhing, refpected the rights and property of his fubjects, and obtained the efteem and affection of his people. Frederic married the daughter of the duke of Mecklenburg, and thenceforth attended to the prefervation of peace, and promoted the profperity of his dominions. He augmented the univerfity of Copenhagen, and was the active patron of learning and learned men, among whom was the celebrated aftronomer Tycho Brahe. He died in 1588, leaving behind him a high character, as well among his own people as with neigbouring nations. So highly was he efteemed by foreign princes, that queen Elizabeth fent him the order of the garter, and James VI. king of Scotland, entered into a treaty with him for obtaining in marriage his daughter Anne. Univer. Hift. Moreri.

Frederic III., king of Denmark, born in 1609, was fon of Chriftian IV. and fucceeded to the crown in the year 1648, but his authority as a monarch was greatly curtailed by the power which the great lords of his kingdom affumed. One of his firft meafures was a treaty with the Dutch, the friendfhip of whom he acquired by feizing in the port of Copenhagen a fleet of Englifh merchant fhips laden with naval ftores; which ftep, while it involved him with England, obtained for him a fubfidy and league of alliance from Holland. In 1657 Frederic, ftimulated by the Dutch, declared war againft Sweden, but the warlike Charles Guftavus foon repreffed the progrefs of the Danes, and paffing over the ice to Zealand, laid fiege to Copenhagen. Notwithftanding the courage and vigour of Frederic, he was compelled to make peace upon very difadvantageous terms. War, however, foon broke out again, and Copenhagen was a fecond time clofely invefted by fea and land. The Swedes took the fortrefs of Cronenburg, and the capital was faved only by the arrival of the Dutch fleet. In this conteft Frederic evinced a bravery not often paralleled: he was always prepared to act, and he perfonally watched over every meafure which was to be adopted for the purpofe of maturing the fucceffes, and reaping from them their full advantage. By his incitements, and by his own example, the citizens of Copenhagen became intrepid foldiers, bravely fought in fmall boats againft the fhips of the befiegers, and rufhed forward through a tempeft of flames. Their wives and children feconded their ardour, and the queen animated them by her prefence and example. That memorable fiege furnifhed inftances of almoft every fpecies of heroifm. After Charles was compelled to retreat, Frederic rewarded the valour and fidelity of the citizens by well merited privileges. Peace was concluded in the year 1660: its terms were the reftitution of all the Danifh ifles of the Baltic, with the diftrict of Drontheim, while Sweden retained the ifle of Rugen, and the provinces of Bleking, Halland, and Schonen. The moft important event of Frederic's reign was the change of the conftitution from an elective and limited, to an hereditary and abfolute monarchy. This was brought about by the divifions between the different ftates of the kingdom, and the hauteur and felfifhnefs of the nobles, who would not confent to take their fhare with the commons of the public burthens. The king fecretly fomented the difcontents, till the commons, ftimulated by the ill treatment of the nobles, refolved, in conjunction with the clergy, to lay the liberties of the nation at the king's feet. Frederic gladly made ufe of the occafion, and, by means of the army, overawed the nobles to a concurrence in the project. In this manner all the rights and privileges of the ftates were folemnly furrendered, and the king and royal family received the homage of the different orders in a public theatre prepared for the purpofe. This important revolution was effected without bloodfhed, and Frederic never abufed the gift: he regulated the feveral parts of government, efpecially the mode of fucceffion, and iffued what has been denominated the "royal law." This has been confidered ever fince as the national code in all things pertaining to the fucceffion and the power of the monarch. No fooner had he obtained poffeffion of abfolute authority, than he moderated that paffion for glory which he had formerly betrayed. The remainder of his reign was fpent in forming political alliances, and reftoring profperity to his country by the arts of peace. He applied himfelf to reftore, by his own example, the ancient fimplicity of drefs and frugality at table; to re-eftablifh his finances; to encourage merit, induftry, and commerce; to reward thofe who had ferved him with fidelity; to redrefs grievances; to protect the oppreffed; to relieve the indigent; and to become the father of his fubjects. The intimate connection between Holftein and Sweden was the principal caufe of his difquiet;

disquiet; and he was preparing to support his cause by arms when he was carried off by a chronical disorder in 1670. Univer. Hist. Moreri.

Frederic IV., king of Denmark, was born in 1671, and succeeded his father Christian V. in 1699. He immediately made an attack upon the dominions of the duke of Holstein, but was soon called back to defend Copenhagen from the attack of Charles, who began his wounderful career by a spirited invasion of Zealand. Frederic sued for and obtained peace on condition that he repaired all the wrongs he had done to the duke of Holstein, and yielded him full sovereignty of his dominions. Frederic was more successful at sea and land in the years 1714 and 1715, when they gained great advantages, drove the Swedes out of Norway, and took several places. In 1720 peace was concluded under the mediation of England, upon terms favourable to Frederic, who retained the duchy of Slefwick. From that time he governed his dominions in peace, and attended to their internal prosperity. He died in 1730, leaving the character of an able prince, but too much addicted to enterprize, and too readily listening to the schemes of projectors. He is charged with having distributed thepublic treasure with a too lavish hand among his courtiers. Univer. Hist.

Frederic V., king of Denmark, was born in 1723, and succeeded his father Christian VI. in 1746. On his accession he formed the resolution of discharging all the debts of the crown. The principal creditors of the state, wishing to divert him from his purposes, offered to reduce the rate of interest rather than have their money paid. "The wealth," replied the monarch, "locked up in my coffers would be of no use to the public, but when I shall have repaid it, you will do me a pleasure, and render me a service, by lending those sums at a low interest to my subjects, who may thus be enabled to extend their commerce and support their manufactures." He preserved his dominions in peace, and promoted commerce and the manufactures, so as to make a large increase to the wealth of his people, and his own revenues. He established a Greenland company; laid open to all his subjects the trade to the American colonies; encouraged agriculture, and the working of the mines, and made new roads. He was the zealous patron of the arts and sciences: founded several academies and other places of instruction for the Laplanders; and instituted societies for the improvement of painting, sculpture, and architecture, and sent a mission of learned men into the Levant for the purpose of making discoveries in natural history and antiquities. He died January 1766, and could console himself on his death-bed with the pleasing and delightful reflection, that "he had never injured a single individual, and had not a drop of blood to answer for." Frederic was twice married, first to Louisa daughter of George II. of England, and secondly to Juliana Maria, daughter of the duke of Brunswick Wolfenbuttle. Univer. Hist.

Frederic Augustus I., king of Poland and elector of Saxony, son of the elector John George III. by a daughter of Frederic III. king of Denmark, was born in 1670, and succeeded to the crown of Poland in 1697. For this high honour there were many candidates, but in a short time the competition was confined to Frederic and the prince of Conti. As a preliminary step he openly abjured the protestant religion, and by lavishing the Saxon treasures, he was able to counterbalance the art and eloquence of abbé de Polignac, the French negociator. On the day of election the nobles and others, to the number of a hundred thousand men, assembled on the plain of Warsaw, each palatinate being divided into companies, and ranged under their proper banners, with all the electors on horseback, armed with lances. The senators having taken their stations, each in front of his division, commenced their harangues: and the cry of "long live Conti," was almost universal, till the palatine of Culm pronounced with a firm voice the word "Veto," which stopped the proceedings of the assembly, and the election was postponed to the ensuing day. Early in the morning both parties presented themselves nearly equal in strength. A double election was made, and Poland was thrown into general disorder by the efforts of the opponents. At length Frederic marched a German army into the country, and gained possession of Cracow, where he was immediately crowned, and universally acknowledged as lawful king by the Polish nation. In ratifying the election of Frederic Augustus his own partizans limited the number of forces that he should be allowed to introduce into Poland, and specified the circumstances which should authorize him to require the assistance of his Saxon troops. In defiance, however, of these restrictions, he surrounded himself with Saxons, because, as being his native subjects, he could place greater confidence in them than in the Poles; and to attach them the better to his own person, he loaded them with favours, and bestowed upon them the most honourable and lucrative offices of the state. The Saxons became extremely odious, and when the diet assembled, a demand was made that the Saxon troops should be withdrawn. Frederic resisted, and was, as a consequence, deprived of his right and title to the crown of Poland. This degradation was inflicted by Charles XII. of Sweden, who imposed the most rigorous conditions on the deposed monarch, and, besides compelling him to acknowledge Stanislaus as the legitimate sovereign of the republic, and to renounce all right to the crown and dominions of Poland, required him to write a letter of congratulation to the new king, upon his accession to the throne. Augustus complied, but by the style of his epistle, he evinced his regret, and the violence which he offered to his inclinations. The event of the battle of Pultowa determined Augustus to avow his intentions by a public declaration of breaking the treaty he had contracted with Charles XII. and of re-ascending the throne of Poland, and he concluded with requesting the assistance of all Christian kings and princes. Stanislaus, who saw himself abandoned by his friends, his protector a fugitive, and his rival supported by the most powerful monarch of the north, was no sooner informed of the approach of Frederic, than he declared that as he had taken the sceptre with no other view than the preservation of liberty, he was now ready to restore it, provided that sacrifice would promote the tranquillity and peace of the country. Frederic ascended the throne without opposition. For some years his reign was disquieted by jealousies on the part of the Poles who could never be reconciled to the presence of the Saxon troops: at length, however, the civil divisions were terminated, and the remainder of the reign was passed in peace. Frederic died at the age of sixty-three. He had for some years previously to his decease resided in his electoral states, where he was much beloved. He introduced an improved code of laws, founded several professorships, and a college for educating the nobility at Dresden, and was the author of other useful and splendid establishments. Though he had, as we have seen, conformed to the Romish religion, he protected the Polish protestants from persecution. His consort continued to profess the reformed religion till her death, and was, on that account, never crowned queen of Poland. Univer. Hist. Moreri.

Frederic Augustus II., king of Poland and elector of Saxony, son of the preceding, was born in 1696, and succeeded his father in 1733 to his electoral and hereditary dominions.

dominions. On the death of the first Frederic, the French party set up Stanislaus Leszinsky, but the Austrians and Russians supporting the late monarch's son, Frederic Augustus, he was crowned king at Cracow in 1734, and after a short contest was left in the quiet possession of his crown. This reign is not signalized by many important events, but in the year 1745 the king of Prussia took possession of his electoral dominions, though he was not able to retain them. He again occupied the same territory in 1756, and kept them till the peace of 1763. In the autumn of the same year Frederic Augustus died, leaving behind him several children, among whom was the dauphiness of France, and mother to the unfortunate Lewis XVI. Frederic possessed many private virtues, but was not active and enterprising as a king. Univer. Hist. Moreri.

FREDERIC, king of Sweden, prince of Hesse Cassel, was born in 1676. He married for a second wife the sister of Charles XII. king of Sweden, who upon the decease of her brother, in 1719, was elected by the states his successor, upon condition of great limitation of the royal authority. In the following year she obtained the consent of the states to resign the crown to her husband, who accepted it with all those stipulations which rendered it the most limited monarchy in Europe. The insufficiency of his powers rendered him unable to resist the invasion of the Russians in 1741, who pillaged the country, and did great injury to the iron and copper mines. On a subsequent war the superiority of the Russians was still more manifest: the Swedes were routed at every encounter, great part of their army was made captive, and all Finland lost. Frederic died, without posterity, in 1751. Univer. Hist.

FREDERIC-WILLIAM, elector of Brandenburg, surnamed the "Great Elector," son of the elector George-William, was born in 1620 at Berlin, and the succession to hereditary estates fell to him in 1640. He was brought up to the profession of arms, and served in the camp of Frederic-Henry, prince of Orange. When he succeeded to his dominions, he found them almost ruined by the Swedes and other powers, who had ravaged them without mercy in the late administration. The commencement of his own government was marked with great prudence and wisdom; he corrected abuses of various kinds, and restored the finances to order. In 1642 he received the investiture of Prussia from the king of Poland, and in the next year he made a truce with the Swedes, on the express condition that they should evacuate the greatest part of his states, so that in a short time he recovered the whole of his dominions. To oppose or counteract the ambitious projects of Charles-Gustavus, king of Sweden, he entered into an alliance with Holland, and was extremely desirous of obtaining the friendship of Cromwell and Lewis XIV. In 1655 he concluded a treaty with the Swedes, whose army he joined in the invasion of Poland, contributed very much to the victory gained near Warsaw, and obtained for his services the entire sovereignty of Prussia. In consequence of a powerful league formed against the king of Sweden, the elector deserted his party, and made peace with the Poles on the same condition respecting Prussia; he now exerted himself most vigorously in favour of his new allies, and the war in the north subsisted, with various success, till the death of Charles-Gustavus in 1659, an event that was soon followed by a general peace which guaranteed Prussia to the elector. Some years of public peace gave the elector an opportunity of displaying his character as a promoter and patron of those arts which render a nation great. Of this opportunity he took every advantage: he rebuilt the dilapidated towns and the ruined villages; converted forests and deserts into cultivated fields; he facilitated commerce and navigation by canals, and other projects and establishments calculated for that purpose. Nor was he less attentive to exterior concerns, and omitted no occasion to secure and extend his territorial possessions. When the ambition of Lewis XIV. threatened Holland, the elector concluded a treaty with the United States, by which he engaged to furnish them with an army of twenty thousand men in case of an attack. Joined by the imperial troops, he began his march in 1672, but was stopped by marshal Turenne, who took possession of all his territories in Westphalia. At this moment a wretch offered to rid him of his formidable enemy by assassination, which he rejected with the utmost horror and indignation, and instantly sent word to Turenne of his danger. Soon after this, prudential motives obtained the ascendancy in his mind, and he made a separate peace with France, by which he gained all his lost provinces. He had in this treaty reserved to himself the right of defending the empire if it should be attacked, which he exercised in 1674 by joining the allies with a body of troops in Alsace. The French, to free themselves from this enemy, instigated the Swedes to make a diversion in their favour by invading the marches of Brandenburg; a measure that forced the elector back to the defence of his subjects, and in June 1675 he obtained a signal victory over a superior Swedish army. In another instance, he was summoned to defend Prussia against the same enemy; he marched in the midst of winter, crossed the gulf of Courland with his army on sledges over the ice, surprized the Swedes in their quarters, and forced them to a precipitate retreat from Prussia, with the loss of the greater part of their forces. He now suffered some serious reverses from the French arms, and reluctantly agreed to the peace of St. Germain in 1679, by which he restored all his conquests upon the Swedes, and abandoned the king of Denmark; and in return the French evacuated the Westphalian dominions, and paid him a sum of money. From this time we hear no more of Frederic as a warrior, but we see him in a more elevated character, attending to the improvement of his country, and to the augmentation of its happiness; and the reputation he had acquired for wisdom and equity caused him to be chosen mediator on various occasions between contending sovereigns. The revocation of the edict of Nantes gave him a valuable accession of industrious subjects, who enriched his country with their arts and manufactures. A French colony was formed at Berlin, which flourished extremely in consequence of the privileges which he conferred upon it. Frederic died of the dropsy at the age of sixty-eight, in the year 1688. He beheld the approaches of death with composure, and employed his last hours in anxious cares for the public good. In private life he was kind and generous, fond of society, quick in his temper, but readily appeased. He is considered as the boast and glory of his house, and the chief founder of its greatness. Gen. Biog.

FREDERIC I., king of Prussia, was son of the preceding, and born at Konigsberg in 1657. The constitution of this prince was weak and sickly, and his education greatly neglected; at one time the prejudices of his father ran so strong against him, that he had determined to change the order of the succession, and made a will, by which he devised all the acquisitions of territory he had himself made to be divided among the children which he had by his second wife, to the prejudice of the subject of this article. This disposition was not allowed to take place, and Frederic succeeded to the whole inheritance in the year 1688. Naturally ambitious, but not possessing sufficient vigour to raise himself above his neighbours, who were equally powerful with himself, Frederic attempted to supply this defect by the pomp of titles,

and

and turned his thoughts to the acquifition of the regal dignity; this was the great object of his ambition, and the minifters who oppofed the project as chimerical and frivolous were quickly difgraced. In the war carried on refpecting the Spanifh fucceffion, he ventured to unfold his defign, and made it a principal condition of his co-operation with the emperor, that he fhould be recognized king of Pruffia, and a treaty to this effect was concluded at Vienna in 1700. It was foon concurred in by the powers of the north and by England, and the coronation was performed in 1701, in memory of which event he inftituted the order of the knights of the black eagle. At the folemnity, it was remarked that he put the crown on his own head, and it is certain that no monarch was ever lefs clogged with conditions on the part of the people. Hiftorians have confidered this ftep as a mafterftroke of policy, and that which raifed the houfe of Brandenburg to its independence on that of Auftria; but at the time when the piece was acting, it was generally believed that Frederic had folicited an honour which his power was inadequate to fupport. Even his confort, Sophia-Charlotta of Hanover, fifter of our George I., a woman no lefs diftinguifhed for her literary merit, than for the characteriftic virtues of her fex, was fo little pleafed with her elevation to the rank of queen, that fhe declared fhe felt extremely mortified to be forced to go to Pruffia and act the part of a ftage-queen in prefence of her Æfop, alluding to the deformity of Frederic; and to the celebrated Leibnitz fhe wrote, "Do not imagine that I prefer this pageantry and pomp of crowns, which are here fo much efteemed, to the charms of philofophical retirement." Frederic, now a king, difplayed all the magnificence of which he was capable, and was profufe to a degree, which his country was ill able to fupport. He was, however, at the defire of his queen, the inftitutor of the Royal Academy of Sciences at Berlin, becaufe fhe perfuaded him that it was a fit appendage to royalty to patronize the fciences. When Charles XII. of Sweden became formidable by his victories, Frederic obtained a neutrality for Pruffia: but in the fucceffion war, his troops ferved againft France, and he even declared war againft Lewis XIV. In 1705 his queen Sophia Charlotta died with the utmoft calmnefs, recollection and compofure: "Weep not for me," faid the dying queen to one of her attendants, "I am now going to fatisfy my curiofity refpecting the principles of things which even Leibnitz has never been able to explain to me; and I am preparing for the king my hufband the exhibition of a funeral pomp, in which he will have full opportunity of difplaying all his oftentation and magnificence." In truth fhe was not miftaken; the king honoured her with a fplendid funeral, and in the pomp he compenfated, in his own mind, for the lofs of a wife whofe death could not be fufficiently deplored, and in 1709 he took another, which was his third. In the enfuing year his Pruffian dominions fuffered greatly from a peftilential diforder, which carried off multitudes of his fubjects, but the court attempted no means of relief, being too much abforbed in vain and oftentatious expences. Amidft the fubfequent difturbances of the north, Frederic employed his efforts to reconcile the different parties, and preferve his own dominions in peace. He died in 1713. "He was," fays his royal defcendant "magnificent and generous; but at what price did he purchafe the pleafure of gratifying his paffions! He trafficked in the blood of his people with the Englifh and the Dutch, like the wandering Tartars, who fell their herds to the butchers of Podolia." It has been faid of him that "he was great in little matters, and miferably little in great concerns." He has, however, the misfortune to hold his ftation in hiftory, between a father and a fon, by whofe great and tranfcendant abilities his merit is eclipfed. Univer. Hift.

Frederic William, king of Pruffia, with both names is confidered as the Ift., but as "Frederic" only, he is the IId. of that name. He was fon of the preceding by Sophia Charlotta, and born in 1688. At an early age he difplayed a paffion for military exercifes, and highly diftinguifhed himfelf in the allied army againft the French. In 1706 he married the princefs Sophia Dorothea, daughter of the elector of Hanover, afterward king George I. of England. On the death of his father in 1713 he fucceeded to the throne, and exhibited a character in every refpect the reverfe of that already delineated. He made great reductions, facrifices as they would be termed by little minds, in all the eftablifhments of royal pomp, and applied his whole attention to render his country great, by maintaining a full treafury and a powerful army. In his own perfon he was extremely plain, and in his manners fimple and eafy of accefs. He abolifhed all ufelefs expenditures, retained but few perfons about himfelf, and reduced his private expences to a very moderate fum. He was accuftomed to fay, "that a prince ought to fpare not only the blood, but the property of his fubjects;" and in this refpect he might be regarded as a philofopher on the throne; and the frugality which he exercifed was worthy the character of an ancient Roman in the beft age of the republic. By this moderation, and by his reforms in the finances and expenditure, he was enabled to keep up a great military eftablifhment, and he was the founder of that exact difcipline and regularity for which the Pruffian troops have been fo much admired. He was remarkably defirous of tall men for his army, and he indulged the paffion to a degree of ridiculous extravagance. He had a regiment compofed folely of giants, whom he picked up from all the neighbouring countries at a vaft expence, and without any regard to the means by which they might be obtained: he fent to purchafe them from the extremities of Europe to the borders of Afia: many of them were entrapped into his fervice, and others involved in quarrels, for the fake of having a pretence to their future fervices. He was equally attentive to propagate the breed by matching them with the talleft women in his dominions, who were compelled to the union. Nothing, indeed, could be more defpotic than his whole military fyftem. In other refpects he ftudied the happinefs of his fubjects, and the profperity of the ftates. Soon after his acceffion he was recognized as king of Pruffia in a treaty with France. Tired of the humiliations which his father had frequently fuffered from the Swedes and Ruffians, who marched their troops through his dominions with impunity, he determined to protect his fubjects from the confequences of any future rupture that might happen among his neighbours. The mind of the monarch was excited to the formation of his plans by the obfervations which he had heard, when young, from two Englifh generals, one of whom boldly afferted that the king of Pruffia could not maintain a force of fifteen thoufand men without the aid of foreign fubfidies, while the other contended that he was able to fupport twenty thoufand. The prince, though a ftripling, faid with a degree of warmth that furprized the difputants, "The king, my father, is able to maintain a force of thirty thoufand men, if he thinks proper." In the firft year of his own reign he contrived almoft to double that number without the help of foreign fubfidies. Notwithftanding the peace of Utrecht, war continued in the north between Charles XII. and the emperor of Ruffia, and the kings of Poland and Denmark; into this Frederic did not wifh to enter, but was compelled by an attack of Charles, who made five hundred of the

Pruſſian ſubjects priſoners of war. Frederic, now affected by the inſult, exclaimed, "What! ſhall a prince whom I ſo much eſteem compel me to become his enemy?" He immediately declared war, put himſelf at the head of his army, and joined the Saxons and Danes with twenty thouſand troops. After compelling the king of Sweden to abandon his territories, and to ſeek refuge in a foreign land, the conquerors divided among them the ſpoils of the conquered. Neverthelefs, when Frederic heard of the news of the premature death of Charles (ſee CHARLES XII.) he ſhed tears, and did juſtice to the noble qualities of that prince, whoſe enemy he had moſt reluctantly become. After this, Frederic interfered with effect in favour of the proteſtants of ſome neighbouring countries, who were oppreſſed and perſecuted by their catholic ſovereigns. Frederic liberally rewarded the induſtry and ingenuity of the introducers of new arts; and many of the richeſt fabrics in the country owe their eſtabliſhment to him; but his patronage was entirely confined to what he deemed uſeful. Being void of ſcience and ornamental literature, and not knowing how they could be connected with the public proſperity, he regarded them with contempt, and treated their profeſſors with every ſpecies of diſcouragement. Poetry and abſtract philoſophy were equally his averſion. He baniſhed a man of letters for ſome Latin verſes over the gate of the palace, and expelled the celebrated Wolf for his metaphyſical opinions; and his eldeſt ſon, the prince royal, who had acquired a great partiality for polite literature and muſic, was ſo continually thwarted by the king, and rendered ſo extremely uncomfortable, that he took the reſolution of privately quitting the Pruſſian dominions for France or England. His deſign was diſcovered, its execution prevented, and the prince himſelf, with two young officers who were his confidants, were proceeded againſt as criminals. One of them had the good fortune to eſcape; but the other, a very amiable youth, was condemned to death by the ſtern and ſavage monarch, who forced his own ſon to be a ſpectator of the bloody deed. The prince himſelf very narrowly eſcaped a like puniſhment, but after ſeveral months' cloſe impriſonment he was ſet at liberty. Such a father, however, could not expect to inſpire in the heart of his ſon any other feelings than theſe of horror, and the more ſo, becauſe about the ſame time he cauſed a young woman, ſuſpected only of an intrigue with the prince, to be publicly whipped through the ſtreets of Berlin. In every inſtance he was moſt rigorous in his puniſhments, and always ſhewed an inclination to aggravate rather than mitigate them. In the year 1734 Frederic-William fell into a bad ſtate of health, which increaſed the natural violence and irritability of his temper: to his phyſicians he even behaved with great brutality, though he held the celebrated Hoffman in ſome reſpect. At length he became tranquil and reſigned to his approaching fate, and died in the year 1740, and in the fifty-ſecond year of his age. At this time he probably relented and was grieved for his conduct towards his ſon, with whom he held many conferences previouſly to his deceaſe, teſtifying the greateſt regard for him, and in his arms he at length expired. Frederic-William left behind him an army of ſixty-ſix thouſand men, and an abundant and increaſing treaſury. All his affairs were in the greateſt order and regularity, and to the labours and pre-eminent wiſdom of this prince we are to look for the ſources of that proſperity and ſucceſs, which diſtinguiſhed the houſe of Brandenburgh till it was humbled by the talents of the preſent emperor of France, before whom the monarchs of Europe have appeared almoſt as nothing. Univ. Hiſt.

FREDERIC III. king of Pruſſia, generally denominated "The Great," was ſon of the preceding, and born at Berlin January 24, 1712. In the progreſs of his education he enjoyed very few advantages, for his father wiſhed to make him a complete ſoldier at the expence of every literary accompliſhment. As, however, he grew towards manhood, he diſplayed a taſte for the liberal arts, which, as we have ſeen, had nearly coſt him his life. This taſte was formed by the peruſal of French books which were put into his hands, and to which all his reading was confined. The tyranny which he experienced from his father was the means of turning his attention to ſcientific purſuits, and being unwilling to incur the king's diſpleaſure, from which he had already ſuffered ſo much, he retired in a meaſure from the world, and purſued his ſtudies in private; and to the amuſing branches of literature he added the ſolid attainments of the mathematics and philoſophy. In 1733 he married, by order of the king his father, Elizabeth-Chriſtiana, a princeſs of the houſe of Brunſwic-Wolfenbuttle; but it is certain, though obliged to marry, that he never cohabited with her, though it is generally ſuppoſed that it was not mere perſonal diſlike that prevented a cloſer union, but that ſome phyſical cauſe exiſted with reſpect to the prince. Frederic had not long been ſeated on the throne before he manifeſted an inclination to uſe his utmoſt efforts for enlarging his dominions. His father's ſuccour to the imperial army in 1734 had given him an opportunity of converſing with prince Eugene on military affairs, and a viſit in the following year to Staniſlaus, king of Poland, then a fugitive at Konigſberg, gratified him with the friendſhip of an amiable and lettered ſovereign. His connection with literary characters was extended, and in the year 1736 he began a correſpondence with the celebrated Voltaire, who contributed ſo much in forming his opinions and his taſte, and who impreſſed him with that ſpirit of toleration which diſtinguiſhed the whole reign of Frederic. And notwithſtanding the obliquity of Voltaire's mind with reſpect to religion, he did not fail to inculcate upon his pupil the duty of promoting as much as poſſible the happineſs of the people committed to his charge, by the practice of juſtice and humanity, and by the encouragement of the arts of peace. (See VOLTAIRE.) Many perſons of literary diſtinction formed a part of the prince's court, which has been repreſented as the ſeat of the muſes and the graces; and the character of Frederic at this period was that of one of the moſt polite and faſcinating young men in Germany. He aſcended the throne in May 1740, and immediately obtained the poſſeſſion of all that popularity which uſually waits upon a young ſovereign who ſucceeds to an unamiable predeceſſor. The firſt act of the new king was to diſband the regiment of giants; at the ſame time he inſtituted an order "of Merit," which admitted perſons of real worth in arms or arts, without diſtinction of birth or country. He invited many learned foreigners to ſettle in his dominions; he recalled Wolf, and appointed him to be the head of the univerſity at Halle. Maupertuis and Algarotti accepted his invitation, and took up their reſidence with him. While he was a prince only he wrote, and afterwards publiſhed, his "Anti-Machiavel," which was intended to refute the baſe maxims of that author relative to the morals of ſovereigns: but "it was unfortunate," ſays his biographer, "that one of his firſt practical comments upon it ſhould be the ſeizure, by military force, of ſome diſtricts in the biſhopric of Liege, upon which he had an obſolete claim, and which he afterwards readily reſtored for a ſum of money." This was not the only inſtance, by many, in which Frederic, by his own acts, ſhewed how little he regarded the common rules of morality, when they ſtood in the way of his wiſhes as king. On the death of the emperor

peror Charles VI. which occurred in October 1740, a vaft inheritance had come to his daughter, which, though guaranteed by almoft all the powers of Europe, was regarded by many of the fovereigns, among whom was Frederic, as a tempting prey. At the time he did not fully avow his motives, but declared that he had thought proper to caufe his troops to enter Silefia, in order to cover it from being invaded or attacked, and the rather becaufe the duchy ferved as a barrier to his dominions, whither the flames of war, which now threatened Europe, might be extended, and expofe them to danger. He has, however, fince that period, in an account of himfelf, honeftly declared that he was probably induced to take this meafure becaufe he had "an army quite fit to march, a treafury ready prepared, and, perhaps, the ambition of acquiring renown." He affembled a choice army of 30,000 men, at the head of which he put himfelf, though fcarcely recovered from an intermittent fever, in the middle of December, beginning his march the morning after a grand mafked ball. A feeling of propriety induced him to erafe the word *Deo* from the motto of his ftandard, in which it was joined with *pro Patria*, and he caufed the appropriate Roman eagle to be borne before his regiment of guards; and it is faid, that on mounting his horfe, and taking leave of the marquis de Beauveau, the French minifter, he obferved, "I believe I am going to play your game for you; if the aces turn up, we will divide." He penetrated Silefia with little oppofition, and levied heavy contributions on the inhabitants, under pretence of fubfifting his troops. The Silefians, not poffeffing a force fufficient to oppofe the Pruffians, were compelled to fubmit. He foon, however, found his progrefs arrefted by an Auftrian army, which engaged him at Molwitz, and in this engagement he was himfelf carried away in the rout of his cavalry, and his behaviour at the inftant fubjected his courage to fome imputations, which, however, his future heroifm abundantly obliterated. The Pruffians were finally victorious in this combat, and the king took poffeffion of Breflaw, the capital of the province, where he received the homage of the ftates. He returned in triumph to Berlin towards the clofe of the year, having firft fent a detachment of troops to aid the French and elector of Bavaria in their invafions of Bohemia and Moravia. At length he made a feparate treaty at Breflaw with the queen of Hungary, who was glad to free herfelf from fo dangerous an enemy by ceding to him all Silefia, except three duchies, and alfo the principality of Glatz in Bohemia. Thus was Frederic's firft attempt crowned with complete fuccefs. He employed the interval of peace in improving the internal government of his dominions, and forming eftablifhments calculated to promote their profperity. He renovated the Academy of Sciences at Berlin, gave it a more enlarged plan, and provided for it an acceffion of new members. In the year 1744 a war broke out between France and England, and the latter power was fuppofed to have entered into a defenfive alliance with Saxony and Auftria, which Frederic thought might become offenfive againft Pruffia, and as he thought it was his intereft to deprefs Auftria, fo he refolved to effect it. The refufal of the queen of Hungary to concur in the election of Charles VII. to the empire, was the immediate pretext for hoftilities, and in Auguft 1744 Frederic marched with an army of 80,000 men into Bohemia, and laid fiege to Prague, which furrendered after a very fevere bombardment. Notwithftanding this fuccefs, the campaign was fo little to his mind that he forbade all perfons for ever from mentioning it in his prefence. In the following fpring he returned to the fcene of action, and obtained over his opponent, prince Charles of Lorraine, a moft decifive victory. While he was purfuing his fucceffes in Silefia, his general, prince Anhalt, entered Saxony, and gave a very fignal defeat to the Saxon army at Keffeldorff. The king then joined him and proceeded to Drefden, which immediately furrendered. He entered that capital and laid it under very heavy contributions: a treaty of peace was, however, concluded between the kings of Poland and Pruffia, in which Vienna was included. The queen of Hungary was admitted as a party in the treaty of Drefden, and confirmed the ceffion of Silefia according to the terms of the peace of Breflaw, while Frederic agreed to acknowledge her hufband, the duke of Tufcany, for emperor. After the terms of this peace were fettled the Pruffian troops evacuated Saxony, and Frederic returned to Berlin, where he was received by his fubjects with the loudeft acclamations.

The king now employed himfelf in improving his ftates and in reforming the judicial proceedings, which he hoped not only to fimplify, but to render uniform throughout all the different parts of his dominions. For this purpofe he wrote and publifhed "The Frederician Code: or a body of Law for the dominions of the king of Pruffia, founded on reafon and the conftitution of the country." By this code torture, for the purpofe of forcing confeffion, was abolifhed: the number of capital crimes greatly diminifhed; and the rites of the catholic religion were tolerated. Frederic, about this period, appeared as the author of "Memoires pour fervir à l'hiftoire de la Maifon de Brandebourg." This contains a concife account of his electoral and royal houfe, written in a good ftyle, and with apparent impartiality. His reflections are often juft and philofophical; but he has occafionally given way to his prejudices, and mifreprefents incidental matters of fact; neverthelefs, in the dedication of this work to the prince royal of Pruffia, he fays, "I have treated the fubject with freedom and impartiality, fo as to exhibit the princes of your houfe in real colours. The fame pen, which has drawn the civil and military virtues of the great elector, has glanced at the foibles of the firft king of Pruffia, and thofe paffions, which, in the order of providence, contributed afterwards to raife this houfe to its prefent pitch of grandeur. I have divefted myfelf of all manner of prejudice, and confidered princes, kings, and relations only as ordinary men. Far from being biaffed by the weight of power, or from idolizing my anceftors, I have freely condemned their vices, becaufe vice fhould find no patronage on the throne. I have praifed virtue wherever I have found it, but, at the fame time, have guarded againft that enthufiafm which it naturally infpires; to the end that nothing but truth, in her plain and native drefs, fhould reign throughout this hiftory." His next publication was a "Poem on the Art of War," in fix books, which is his largeft poetical production, and which may rank among the moft fplendid and beft planned didactic works in verfe. In this work he has celebrated the talents and courage of many ancient and modern generals; has beftowed the higheft encomiums on prince Eugene, and referred to the battle of Blenheim, yet he has never once mentioned the name, nor hinted at the glory of our illuftrious countryman the duke of Marlborough. (See CHURCHILL.) "It is not to be fuppofed," fays a contemporary writer, "that this filence with refpect to the duke proceeded from invidious motives: we rather think that his Pruffian majefty confidered *him* as a general who underftood *only a part of his profeffion*, having never given any proof of his fkill *in conducting a retreat!!*" To this cutting and farcaftic obfervation Frederic fairly expofed himfelf by his want of candour. The compofition of thefe and other literary pieces, his various ftudies and amufements, and the journeys which he undertook to different parts of his dominions, occupied

cupied all the leifure he could command from thofe royal duties which he always performed with the greateft punctuality. His hours of relaxation were devoted to mufic: he indulged his tafte for the fine arts in decorating palaces, and erected fplendid edifices at Berlin and Potzdam, which during his reign became equal, in their exterior, to the fineft places in Europe. Frederic thought it due to his character and confequence to infift upon the right of free navigation for his fubjects, without moleftation from the contending fleets of other nations, and is regarded as the original author of the fyftem of armed neutrality, which has fince produced fo many important events.

At the commencement of the war in 1755 between England and France, the former made a treaty with the king of Pruffia, which produced an alliance between France, Auftria, and Ruffia. Thus the whole political fyftem of the continent was changed: the feeds of a new war were plentifully fcattered, and they foon ripened into events more extraordinary and interefting than Europe had for a long time witneffed. The feven years' war began in 1756 with the march of the king of Pruffia, who was fully apprized of the confederacy which had been formed againft him, in cafe of his giving rife to a new war. He neverthelefs demanded of the emprefs-queen the intention of certain armaments and warlike preparations which were making in her dominions, and whether they did not immediately concern him. Her anfwer was not fo explicit as Frederic wifhed, and he inftantly commenced hoftilities, and involved himfelf in a long and hazardous war, in the courfe of which he acquired a high degree of military fame, but which occafioned, what is little regarded by continental fovereigns, a miferable effufion of human blood, and was productive of much calamity to the Pruffian dominions, as well as to the neighbouring countries. Frederic demanded a paffage for his army through the electorate of Saxony, and did not wait for permiffion to enter the country. The king of Poland, the elector, who had already experienced his power, affembled his troops at the ftrong camp of Pirna, and repaired thither in perfon, leaving his queen at Drefden. Frederic, who by the treachery of a Saxon fecretary had been informed of the king's negociations with his enemies, thought himfelf juftified in feizing to his own ufe all the public revenues of Saxony, and breaking open the fecret cabinet in the royal apartments, notwithftanding the perfonal efforts of the queen to prevent him. He next affumed the entire government of the electoral dominions, difmiffed the Saxon council and minifters of ftate, obtained poffeffion of the camp of Pirna, and compelled the common men of the Saxon army to enter among his own troops. At the beginning of 1757 the enemies of Frederic were affembling forces againft him on all fides, and every method adopted to excite a general abhorrence of his conduct, and he was put under the ban, or curfe of the empire, with all the cuftomary formalities. The king, though menaced, was undifmayed, and determined to carry war into the enemies' country: he advanced with four feparate bodies into Bohemia, which he united under his command, and on the 5th of May he fought the battle of Prague, which proved very bloody, but at length terminated in favour of the Pruffians. The Auftrians were obliged to take fhelter in the city, which Frederic immediately invefted, but, after committing terrible havock among the inhabitants and army, he was forced, by the great marfhal Daun, to raife the fiege, and retreat in the beft manner he was able. The king's affairs were now in an extremely critical fituation: he was hemmed in on all quarters, and no activity and refolution fhort of what he poffeffed could have extricated him; neverthelefs, at the clofe of the year he faw himfelf victorious, and freed from the enemies which had fo clofely preffed him. The fplendour of the king of Pruffia's actions had rendered him the object of general admiration: in England he was regarded as the proteftant hero fighting for the caufe of religion and liberty, and a fubfidiary treaty was concluded by which England engaged to pay a fum of fix hundred and feventy thoufand pounds fterling to the king of Pruffia, for which he was bound to no fpecific fervices, but only to keep up his forces, and act for the common caufe. In the campaign of 1758 the king penetrated into Moravia, and laid fiege to Olmutz, which was faved by Daun: thence he was called to oppofe the Ruffians, and fought them at Zorndorff, and after a moft obftinate combat gave them a terrible defeat. To a fimilar difafter he was himfelf expofed at Drefden. On the 12th of Auguft in the following year the moft deftructive and horrible battle of Cunnerfdorff was fought. At firft the king made fure of fuccefs, and announced his expectations in a billet to the queen; but having commenced a fecond attack, the fortune of the day turned fo completely againft him, that he difpatched a fecond note faying, "Remove from Berlin with the royal family: Let the archives be carried to Potzdam. The town may make conditions with the enemy." Berlin however did not fall, and by the high military fkill and great prefence of mind of the king, he repaired his own loffes, and completely awed his enemies.

Though Frederic had exhibited the greateft talents and moft confummate prowefs; though he had obtained the moft fplendid victories, and made exertions fo extraordinary, that to common and fuperficial minds they appeared the effect of miraculous interpofitions rather than the ordinary courfe of events, yet he became fenfible that the longer hoftilities continued the more difficulties increafed. His army was not compofed of the fame troops as thofe with which he commenced hoftilities, he had loft vaft numbers of men, not only in action, but by difeafes, by the rigour of the feafons, and by perpetual hardfhips and fatigues. He was therefore, in the year 1761, induced to act chiefly on the defenfive. An event now took place, which was highly favourable to the affairs of the king of Pruffia. This was the death of the emprefs of Ruffia, with whofe fucceffor the emperor Peter III. he inftantly formed a treaty of alliance. This was followed by a peace with Sweden, and though the dethronement and death of Peter deprived him of the aid of Ruffia, yet his fucceffor Catharine II. obferved a neutrality in the remaining conteft. In 1763, a treaty of peace was concluded, called the peace of Hubertfburg, from the caftle of that name, in which the articles were drawn up and figned. This treaty was formed on the bafis of thofe of Breflaw and Berlin, and confirmed to Frederic his former Silefian acquifitions. The emprefs-queen, and the king of Pruffia, renounced all claims upon each other's territories, and the only compliance made by the latter was a promife to vote for electing the archduke Jofeph king of the Romans. The electoral king of Poland was at the fame time reftored to his wafted dominions without any compenfation. Thus terminated what has ufually been called the feven years' war, between the Pruffian monarch and the great and powerful princes with whom he was engaged in hoftilities. It was one of the moft fanguinary contefts that ever defolated the globe, and though the military fame acquired by Frederic was very great, yet it muft be confidered as a trifling compenfation to his fubjects, for the evils and calamities that they had fuffered, and for the vaft effufion of human blood which had been produced by his ambition, and by that jealoufy which his numerous ftanding army, and his conduct towards his neighbours had naturally and univerfally

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inſpired. Peace being eſtabliſhed, Frederic returned to his capital, from which he had been abſent more than ſix years. The king, for ſome time ſubſequent to this period, cultivated the arts of peace, without neglecting thoſe of war. He concurred, in 1764, in exerting his intereſt to promote the election of count Staniſlaus Poniatowſki to the throne of Poland, in the room of Auguſtus III. who died ſoon after his reſtoration to his electoral dominions. Frederic received a viſit from the emperor of Germany, in the year 1769, at Neiſs in Sileſia, where they treated each other in a cordial and friendly manner; and, after ſpending two days in each other's company, parted with the ſtrongeſt profeſſions of mutual regard, eſteem, and confidence. They dined together in company with ſome general officers, among whom was the celebrated Laudohn, who had greatly diſtinguiſhed himſelf againſt the king of Pruſſia in the late war, and who was going to place himſelf at the lower end of the table, but Frederic exclaimed "I muſt beg the favour of general Laudohn to come and ſit by me, for I can aſſure him I had rather have him on my ſide, than oppoſite to me." Although the king kept up an army of two hundred thouſand men, fully equipped and diſciplined, yet he was extremely attentive to his treaſury, and was in every reſpect a good public economiſt. He had, however, recourſe to the ſcandalous and villainous meaſure of debaſing the coin which he iſſued from the mint, and then actually refuſed to take it in impoſts at its nominal value. He patronized many ſchemes for the promotion of manufactures and commerce, but was ignorant of the true ſpirit of trade. He violated the privileges of the free city of Dantzic, and practiſed, without heſitation or ſhame, the moſt wicked extortions. He planned the partition of Poland, and received for his ſhare of the booty Weſtern Pruſſia, the moſt commercial, though the ſmalleſt portion of the firſt diviſion. Previouſly to this he had, without remorſe, committed great exactions in the Poliſh territories, from which he had carried off the inhabitants in order to people the uncultivated parts of his own dominions. On ſome diſtricts he had impoſed a very ſingular tax, that of a proportion of their marriageable young women, each provided with a dowry, who were thus torn away from their country and friends, to be ſettled among ſtrangers, and often coupled with beings little better than barbarians. After he had taken poſſeſſion of that part of Poland, which the royal robbers had aſſigned to Pruſſia, he impoſed a variety of new and arbitrary regulations on the inhabitants of the uſurped provinces; and the Jews were obliged, by the ſevere treatment they experienced, to quit the diſtricts that had been ſeized by Auſtria and Pruſſia, and to retire into the provinces allotted to Ruſſia. To the Jeſuits, in other parts of his dominions, Frederic was more favourable, and though the pope had aboliſhed the order, he afforded them, as men of talents and real learning, an aſylum in the Pruſſian territories. One of the moſt important of the remaining public events of Frederic's life, was that which related to the project of diſmembering the electorate of Bavaria, by the court of Vienna. On this occaſion Frederic was the aſſertor of the liberty and independence of the Germanic body, and the oppoſer of lawleſs ambition: he took the field in perſon in 1778, with a powerful army, and was oppoſed by the emperor Joſeph and Laudohn, with an equal force. No action however enſued, and, in 1779, a treaty was entered into, which produced an abandonment of the deſigns of the Auſtrian court. In 1785, a plan was formed by the emperor for exchanging, with the elector-palatine, the low countries for Bavaria, which the king of Pruſſia defeated, by propoſing a confederation for maintaining the indiviſibility of the empire, and the laws of the Germanic conſtitution, which was immediately joined by ſeveral of the principal members of the empire. About this period the Pruſſian court remonſtrated with the ſtates of the United Provinces concerning the limitations of the power of the ſtadtholder, which were then in agitation. The Pruſſian miniſter preſented a memorial to the States-general, in which he requeſted, in the name of his maſter Frederic, that they would take ſuch meaſures as might effectually put a ſtop to the perſecutions that were then carried on againſt the ſtadtholder, and that they would maintain him in the enjoyment of thoſe prerogatives, which, it was ſaid, were the rightful attributes of his perſon and family. In 1786, a treaty of amity and commerce was concluded between Pruſſia and the United States of America, which was a model of liberal policy reſpecting the rights of two independent nations both in peace and in war.

Frederic, as he advanced in years, became milder and more humane, more attentive to the real welfare of his ſubjects, and more diſpoſed to prefer the uſeful to the ſplendid. His exertions in promoting agriculture, manufactures, and thoſe arts of life by which the lower and middle ranks of life are rendered comfortable and flouriſhing, were unrivalled by thoſe of any ſovereign of his time, and the increaſe of population and commerce in the Pruſſian dominions during the latter part of Frederic's reign, is a ſubſtantial evidence of the general fact. His public cares were unremitted even after he had begun to ſuffer moſt ſeverely under the ſymptoms which attended a gradual decline. He viewed with philoſophic ſerenity his approaching end, and continued to exerciſe with his accuſtomed regularity the functions of royalty, till within two days of his death. He remained in the full poſſeſſion of thoſe uncommon powers of underſtanding, by which he was diſtinguiſhed, till the 15th of Auguſt, and reſigned his breath Auguſt 17, 1786, in the ſeventy-fifth year of his age, and the forty-ſeventh of his reign.

Frederic had unqueſtionably a claim to be ranked among thoſe princes who are called *Great*: as a general, though liable to error, yet his enterprize and comprehenſion, the accuracy with which he directed complicated plans, his foreſight in providing for all wants and exigencies, the boldneſs of his deſigns, and the vigour of his execution, have rarely been ſurpaſſed ſince the time of Cæſar. That he was laviſh in the lives of his ſoldiers, has been imputed to a defect rather of feeling than of judgment. He conſidered them as the inſtruments put into his hands for the purpoſe of playing a great game, and he made it finally a winning one. His political talents were conſiderable, and adapted to the rank he held in the world as an abſolute monarch. In perſon he was ſomewhat below the middle ſtature, but his limbs were well formed, and he poſſeſſed a healthful and vigorous conſtitution. His intellectual powers were great, and his acquirements in literature were very reſpectable. He had much general knowledge of the ſciences, and was converſant with the beſt French writers on polite literature: but his ſkill in the ancient authors was derived through the medium of French tranſlations; his character and conduct varied very much with the ſituations which he was called to fill; his predominant paſſion was the love of glory, and he was ambitious to unite in his own perſon the reputation of a great king, a wiſe legiſlator, an illuſtrious hero, an accompliſhed general, a fine poet, and an enlightened philoſopher. His judgment was naturally ſolid, but in ſome degree perverted by his early prejudices in favour of the French ſchool, and this will eaſily account for his diſbelief of revealed religion; his notions with reſpect to natural religion ſeem to have fluctuated; but his morals were uniformly guided by no other rule than his pleaſure, and what

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he believed to be his intereſt. He was capable of ſevere and very cruel actions, and hence he was characterized by Voltaire, once his friend and idol, from a marble table that ſtood by him, as *hard* and *poliſhed*. (See VOLTAIRE.) The love of juſtice and the principles of humanity took their turns in his mind, and examples are recorded of his clemency and placability; theſe are, however, but few in compariſon of the cruelties which the inhabitants of Saxony, of Poland, and other conquered places can teſtify againſt the Great Frederic, to ſay nothing in this place of enormities practiſed on individuals. (See TRENCK, *Baron*.) As an author, beſides the works already referred to, he publiſhed "Military Inſtructions," and other pieces on miſcellaneous topics, compoſing four volumes octavo under the general title of "Œuvres Primitives." After his death appeared his poſthumous works in 15 vols. of which the principal are "The Hiſtory of his own Time:" "The Hiſtory of the ſeven years' War:" and "Memoirs from the peace of Hubertſburg to the partition of Poland in 1775." To theſe we have had occaſion to refer, but the reader is particularly directed for an able account of this great man and illuſtrious monarch, to Dr. Towers's "Mem. of Frederick king of Pruſſia."

FREDERICA, in *Geography*, a port town of America, in the ſtate of Georgia and county of Glyan, pleaſantly ſituated in St. Simon's iſland, on an eminence upon a branch of Alatamaka river, which forms a bay before the town, and affords a ſafe and commodious harbour for veſſels of the largeſt burden, which may lie along the wharf. It was ſettled by ſome Scots highlanders about the year 1735, who accepted an eſtabliſhment both here and at Darien to defend the colony, if needful, againſt the neighbouring Spaniards. N. lat. 31° 15'. W. long. 80°.

FREDERICIA, a ſtrong ſea-port town of Denmark, in North Jutland, and dioceſe of Ripen; ſituated on the Little Belt, with a cuſtom houſe, where all veſſels pay toll. The circumference is extenſive, but not filled with houſes or people. It was founded in 1651 by Frederic III.; and in 1682 Chriſtian V., in order to increaſe the number of its inhabitants, granted a charter, which rendered it an aſylum for all bankrupts, both natives and foreigners, and allowed the Calviniſts, Papiſts, and Jews, free exerciſe of their religion. Fredericia has ſeveral commercial privileges, but as it wants a good harbour, they are incapable of much improvement. It has two Lutheran churches, a Calviniſt church, a Popiſh church, a ſynagogue, a grammar ſchool, and good arſenal. A quantity of tobacco is planted both within and without the walls. N. lat. 55° 35'. E. long. 9° 44'.

FREDERICK, a county of Maryland, in America, bounded N. by Pennſylvania, W. and N.W. by Waſhington, E. by Baltimore, and S.W. by Potowmack river. On the Monocacy river and its branches are about 37 griſt mills, a furnace, iron forge, and a glaſs manufactory, called the "Ætna glaſs works," which are in a thriving ſtate. This county is more than 30 miles each way reckoning from the extreme parts, and is divided into 12 towns and villages. The Cotoctiny mountain extends from the Potowmack in a N. direction through this county into Pennſylvania, between the ſouth mountain and Monocacy creek; the eaſtern parts are generally level. It contains 30,791 inhabitants, including 3641 ſlaves. The lands of this county are generally rich, producing wheat, rye, barley, corn, hemp and flax. Mines of copper have been diſcovered. It comprehends about 537,600 acres. Its chief town is called Frederick town.—Alſo, a county of Virginia, bounded north by Berkeley, S. by Shanandoah, W. by Hampſhire, and E. by Shanandoah river, which ſeparates it from London county. It is 30 miles in length, and 20 in breadth, and contains 16,257 white inhabitants, and 5118 ſlaves. It abounds with iron ore, and works have been erected which produce 160 tons of bar iron, and 650 tons of pig, annually. Both this and Berkeley county have a good ſoil. Between the waters of Opeckan' creek and the Shanandoah is the richeſt lime ſtone land in the eaſtern parts of the ſtate. Near the north mountain in this county is a curious cave, by ſome called "Zancy's cave." After entering this cave a few feet, the mercury, which, in the open air, was at 50, roſe to 57 of Fahrenheit's thermometer. Beſides this, there is a natural well of unknown depth. The chief town of the county is Wincheſter.

FREDERICK *Henry's Bay*, a bay on the coaſt of New Holland, diſcovered by Taſman in 1642. S. lat. 43° 10'.

FREDERICK-*Henry Cape*, the north point of Adventure bay, in New Holland. S. lat. 42° 42'. E. long. 147° 37'.

FREDERICK *Houſe*, a trading ſtation in Upper Canada, on the head water of Abbitibbe river. N. lat. 48° 35'. W. long. 82° 6'.

FREDERICK, a fort in Waſhington county, Maryland, ſituated on the N.E. bank of Potowmack river, near the S. line of Pennſylvania.—Alſo, a townſhip in Montgomery county, Pennſylvania, containing 697 inhabitants.—Alſo, a town on the N. ſide of Saſſafras river in Cecil county, Maryland, and ſeparated by that river from George town, in Kent county. It lies ſix miles S.W. of Warwick. N. lat. 39° 22' 30".

FREDERICK *Point*, in Upper Canada, lies on the W. ſide of Kingſton harbour, and on the weſt ſide of Haldamand Cove, which is made by this point, and point Henry.

FREDERICKENBURG, a town of Germany, in the principality of Anhalt Zerbſt; one mile S.W. of Zerbſt.

FREDERICKRODE, a town of Saxony, in the principality of Gotha; ſix miles S. of Gotha.

FREDERICKSBORG, a town of Denmark, in the iſland of Zealand; 18 miles N.N.W. of Copenhagen. N. lat. 55° 56'. E. long. 12° 20'.

FREDERICKSBURG, a town of Germany, in the duchy of Pomerania; 25 miles N.N.E. of Stargard.

FREDERICKSBURG, a poſt town of America, in Spotſylvania county, Virginia, on the S.W. bank of Rappahannock river, 110 miles from its mouth in Cheſapeak bay. It is an incorporated town, and laid out into ſeveral ſtreets, of which the principal runs parallel with the river, and contains about 300 houſes, two tobacco warehouſes, and ſeveral ſtores of well aſſorted goods. Its public buildings are, an epiſcopal church, an academy, court houſe and gaol. It is a place of conſiderable trade, and contains about 2000 inhabitants. It has a forge in its vicinity; which works about 300 tons of bar iron in a year, from pigs imported from Maryland. It is 50 miles S.W. of Alexandria, 102 S.W. of Baltimore, and 205 S.W. of Philadelphia. N. lat. 38° 22'. W. long. 77° 36'.

FREDERICKSBURG, a townſhip in the county of Lenox, Upper Canada, which lies to the weſt of Erneſt town, in the bay of Quinté.—Alſo, a townſhip of Dutcheſs county, in New York, ſituated between Franklin and Philliptown, and containing 1661 inhabitants. N. lat. 41° 31'. W. long. 73° 38'.—Alſo, a town of Africa, on the Gold coaſt. N. lat. 6° 40'.

FREDERICKSHALL, a ſea port town of Norway, on the frontiers of Sweden, at the mouth of the river Tiſte, in a bay called the Swineſund; the harbour would be ſafe and commodious, if it were not for the quantity of ſawduſt brought down the river from the ſaw-mills up the

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country, which it is neceſſary to remove yearly. The town contains about 3000 inhabitants. The ſtreets are airy; and the houſes are built of wood painted red, and a few white. The principal commerce of the town conſiſts in the exportation of planks to England. The wood is floated down the Tiſte ſometimes above 100 Engliſh miles from the interior parts of the country, and ſawed here; for which purpoſe 36 ſaw-mills are erected on the banks of the river, which forms a ſeries of cataracts. The port poſſeſſes a few immunities; goods landed for exportation pay no duty, unleſs opened for home conſumption; and then they are charged with the uſual impoſts. On the ſummit of an almoſt perpendicular rock, which overhangs the town, ſtands the ſtrong and hitherto impregnable fortreſs of Frederickſtein, rendered memorable by the death of the northern lion, as Charles XII. is ſometimes emphatically ſtyled; 52 miles S. of Chriſtiania.

FREDERICKSHAM, a town and fortreſs of Ruſſia, in the government of Wiburgh or Viborg, formerly belonging to Sweden when it was only a ſmall village, in the province of Finland, but ceded to the Ruſſians by the peace of Abo. The town is ſmall and regular; in the centre is a ſquare, from which the ſtreets extend at right angles. The houſes, excepting one of brick, are all built of wood in the neateſt manner. The fortifications are ſtrong; and the garriſon and ſeveral companies of ſoldiers, quartered in the neighbouring villages, amount to 6000 troops. The inhabitants carry on a ſmall commerce with England and Holland, exporting planks and tallow, and importing ſalt and tobacco. In 1783, Frederickſham was the ſcene of an interview between Catharine empreſs of Ruſſia and Guſtavus king of Sweden, which continued three days. The empreſs, with a magnificence, before unknown to theſe northern regions, erected a wooden palace, which contained a grand ſuite of apartments, and a theatre, in which French plays were acted. This town is diſtant 50 miles W. from Viborg or Wiburgh. N. lat. 60° 36′. E. long. 28° 18′.

FREDERICKSHOLM, a fortreſs of Norway; three miles S. of Chriſtianſand.

FREDERICKSTADT, a fortreſs and ſea-port town of Norway, ſituated on the river Glomme, nearly 26 Engliſh miles from Frederickſhall. This is the moſt regular fortreſs in this part of Norway, and contains an arſenal amply ſupplied with arms for the militia, in caſe of a rupture with Sweden. It was built in 1567 by Frederic II., ſtrengthened by Frederic III., and ſince gradually enlarged and fortified, according to the modern ſyſtem. The ramparts incloſe a circumference of ¾ of a mile, and the population of the town, including the two ſuburbs, amounts to no more than 800 perſons. The inhabitants export planks, and a few ſmall maſts. Cloſe to Frederickſtadt is the new fortreſs of Kongſteen, on a rocky eminence, capable of containing a garriſon of 300 men; ſeveral convicts are here condemned to hard labour. The greateſt offenders have an iron cap, chains round their arms, legs, and bodies; the chains round their arms are rivetted to a wheel-barrow, which is never looſened. Frederickſtadt is 43 miles S. of Chriſtiania. N. lat. 59° 2′. E. long. 11° 1′.

FREDERICKSTADT, a town of Denmark, in the duchy of Sleſwick, ſituated on the north coaſt of the Eider; founded by ſome Dutch Arminian emigrants immediately after the ſynod of Dort. The inhabitants conſiſt of Arminians, Lutherans, Calviniſts, Anabaptiſts, Quakers, and Jews. They are chiefly employed in ſilk or woollen manufactures navigation, and commerce; 18 miles W.S.W. of Sleſwick. N. lat. 54° 28′. E. long. 9° 11′.

FREDERICKSTADT. See BERLIN.

FREDERICKSTHAL, a town of Saxony, in the margraviate of Meiſſen; ſix miles W. of Senftenberg.

FREDERICKSUND, a ſea-port town of Denmark, in the iſland of Zealand, ſituated in the gulf of Roſchild. Its chief trade is in corn; 19 miles N.W. of Copenhagen. N. lat. 55° 50′. E. long. 12° 5′.

FREDERICKSVORN, a town of Norway, in the province of Aggerhuus; 3 miles S. of Laurvig.

FREDERICKSWALDE, a town of Germany, in the duchy of Pomerania, on the Ihna; five miles N.W. of Stargard.

FREDERICKSWERK, a ſea-port town of Denmark, ſituated near the Iſe-fiord, a bay of the ſame ſea on the northern ſhore of Zealand, where general Clauſſen, in the year 1756, eſtabliſhed various manufactories, a foundery for cannon, and other works for ſupplying the Daniſh army and navy with ſtores. He alſo new-formed the canal, connecting a ſmall lake with the Iſe-fiord, which had been begun in 1717 by order of Frederic IV., in order to prevent the inundation of the lakes from overflowing the royal eſtates; and hence the place was called Frederickſwerk. The general alſo planted the adjacent country, for the ſpace of ſeveral miles, which was either a moraſs, or covered with drifted ſand; and thus he has ſucceeded in performing a work which Frederic IV. had attempted in vain, *viz.* that of fertilizing this waſte. By theſe means a tract of country which before only fed thirty-two cows, now yields, beſides a large quantity of fire-wood, in a favourable ſeaſon, above 500 loads of hay.

FREDERICKSWERTH, a town of Germany, in the principality of Gotha; 5 miles N.W. of Gotha.

FREDERICKTON, a conſiderable townſhip of America, in the province of New Brunſwick; 90 miles up St. John's river, which is ſo far navigable for ſloops.

FREDERICKTOWN, a poſt-town of Maryland, and capital of Frederick county, ſituated on both ſides of Carrol's creek, a ſmall ſtream that diſcharges itſelf into Monocacy river, over which are two bridges. The ſtreets are regularly laid out, interſecting each other at right angles. The dwelling houſes are about 200 in number, of which ſeveral are commodious and handſome. The public edifices are one church for Preſbyterians, two churches for German Lutherans and Calviniſts, and one for Baptiſts, an elegant court-houſe and gaol, and convenient market-houſe. Its trade is conſiderable with the back country. The Ætna glaſs works are ſituated four miles above the town, in Tuſkarora creek. It is 47 miles W. by N. from Baltimore, and 148 S.W. by W. from Philadelphia. N. lat. 39° 24′.

FREDOLFO, a torrent of Switzerland, in the county of Bormio, which, paſſing by the town of Bormio, falls at a ſmall diſtance into the Adda.

FREDON, Fr. in *Muſic*, an old word for a rapid paſſage or diviſion. *Roulade* is at preſent uſed for the ſame purpoſe, with this difference, that the *roulade* is of longer duration, and is written, whereas the *fredon* was an extemporaneous flouriſh at a pauſe, *ad libitum*.

FREDONIA, in *Geography*, a generic name which is ſuggeſted in Dr. Morſe's Gazetteer as proper for comprehending the whole territory now under the government of the United States; bounded N. by Upper and Lower Canada, E. by New Brunſwick and the Atlantic ocean, S. by Florida and the gulf of Mexico, W. by New Mexico and the Shining mountains, which divide the weſtern waters of the Miſſiſippi from thoſe which fall into the Pacific ocean. This territory lies between 28° and 50° N. lat. and 66° and 116° W. long.

long. from Greenwich. Its extreme length from E. to W. is upwards of 2000 miles, and its extreme breadth about 1500. It is estimated to contain nearly 2,000,000 square miles, or about four-fifths as many as are contained in all Europe. It is about twice the size of the Chinese empire, and if we except Russia, it is by far the largest territory on earth, whose inhabitants live under the same general government. The Missisippi river divides Fredonia nearly in its centre, leaving 1,000,000 square miles E. of it, in the present United States, and nearly the same number of square miles W. of it. The vale, if it may be so called, between the Alleghany and Shining mountains, which is intersected by the Missisippi, and watered by its numerous and large eastern and western branches, contains nearly a million and a half square miles, and may be reckoned among the finest portions of the globe. Fredonia has a sea-coast of many thousand miles in extent, along which are but few islands of much importance, but full of harbours, many of them equal to any in the world. Its mountains, lakes, and rivers, are all upon a large scale. Its climate and soil are adapted to almost all the variety of productions which the earth affords. Over the vast surface of Fredonia are scattered, in some parts (particularly New England) thickly, but generally very sparingly, about five millions and a half of inhabitants, exclusively of Indians, a seventh part of whom is in slavery. The Fredonians, except the aboriginal inhabitants, and the negroes imported from Africa, and their descendants of every shade, are a people collected from almost every nation in Europe, and their posterity. For a description of *Louisiana*, see that article. The great difference in climate, in the modes of obtaining subsistence, in language, religion, and political opinions, and consequently in the feelings and interests of the inhabitants throughout this vast territory, may for ever prevent any great similarity of character. The unavoidable industry and hardihood of the north will always form a harsh contrast to the ease and indulgence of the south. What effect, however, says Dr. Morse, a generic name would have in forming an uniform national character, in defiance of all these obstacles, remains to be tried. Such a name has long been a desideratum. The author has formed an article Fredonia as a specimen of the advantage and convenience of such a name.

FREDONNER, Fr. in *Music*, this word is only used in derision, as we say *quavering*.

FREDOREA, in *Geography*, a small island on the east side of the gulf of Bothnia. N. lat. 63° 1'. E. long. 20° 59'.

FREDUM, in *Antiquity*, a composition made by a criminal to be freed from prosecution, a third part of which was paid into the fiscus or exchequer; or it was the price paid to the magistrate for protection against the violences of resentment. In some extraordinary cases, where it was more difficult to protect the person who had committed violence, the fredum was augmented. Montesq. de l'Esprit des Loix, lib. xxx. cap. 20. and Robertson's Hist. vol. i. chap. v. p. 361.

FREE, a term variously used; but generally in opposition to constrained, confined, or necessitated. (See FRANK.) Thus, a man is said to be free, who is out of prison; and a bird is free when let out of the cage: free from pain, *i. e.* void of pain; we say, a free air, a free passage, &c.

FREE, in speaking of things endowed with understanding, has a more peculiar relation to the will, and implies its being at full liberty.

The Stoics maintain that their sage or wise men alone are free. See LIBERTY.

FREE is also used in opposition to slave.

The moment a slave sets foot on English ground, he becomes to some purposes free. The finest legacy the ancient Romans could leave their slaves, was their freedom. See LIBERTY.

FREE, *aboard a Ship.* The seamen say the pump frees the ship, when it throws out more water than leaks into her; but, on the contrary, when it cannot throw out the water as fast as it leaks in, they say the pump cannot free her: also bailing or lading out water out of a boat is called freeing the boat.

FREE *Agent.* See AGENT.

FREE *Bench*, or *Franc Banc*, signifies that estate in copyhold lands, which the wife hath after the decease of her husband, for her dower, according to the custom of the manor.

Fitzherbert calls free banc a custom, whereby, in certain cities, the wife shall have her husband's whole lands, &c. for her dower.

Thus, at Orleton, in the county of Hereford, the relict of a copyhold tenant is admitted to her free bench, *i. e.* to all her husband's copyhold land, during her life, at the next court after her husband's death.

In the manors of East and West Enbourne, in Berks, if a customary tenant die, the widow shall have a free bench in all his copyhold lands, only *dum sola & casta fuerit*: if she commits incontinency, she forfeits her estate; but if she will come into court, riding backwards on a black ram, with his tail in her hand, rehearsing a certain form of words, in the nature of a confession and petition, the steward is bound by the custom to restore to her her free bench. The words are these:

"Here I am
Riding upon a black ram,
Like a whore as I am:
And for my crincum crancum
I have lost my bincum bancum.
And for my tail's game
Have done this worldly shame.
Therefore, pray, Mr. Steward, let me have my land again."

The like customs hold also in the manor of Chadleworth, in Berks; that of Tor, in Devonshire; and in some other parts of the west.

FREE-*booter*, or *Flibuster*, a name given to the pirates who scour the American seas; particularly such as make war against the Spaniards.

The French call them *flybusters*, deducing the word from the English *flibote*, or *flybote*; because the first adventurers of this kind were the people of St. Domingo, who made their excursions with flybotes, which they had taken from the English. See BUCCANEER.

Free-booter is a person who, without regard to any laws, possesses himself of whatever property chance may throw in his way, and for the aquiring of which he joins with others of a similar description, in order that they may be capable of undertaking various enterprises, and to make more certain of success. The free-booter is the same on shore that the pirate is on the seas; though instances may be adduced in which the latter not only made prize of whatever fell in their way while cruising on the ocean, but held authority over territorial possessions, and thus by carrying on their depredations in both situations, become free-booters; of this class were the buccaneers, so long celebrated for their daring exploits.

Some nations are nothing better than free-booters: thus we

we fee that the Arab hordes which frequent the deferts make no diftinction whatever in regard to the difference of nations. Thefe people, while in one quarter they profefs to be at peace with all the world, in other fituations deem all to be enemies who poffefs property to fuch amount as may be worth contending for.

Unfortunately, we have of late years feen, that the rulers of great and populous kingdoms could fo far difregard every principle of juftice, and fo abufe that confidence which had placed them on the throne, as to become free-booters in the moft literal fenfe of the defignation. With fuch, no tie, no claim could induce to forbearance where there feemed an opening for the plundering of contiguous, or even remote nations, notwithftanding they might, by their generofity, or by their forbearance, have eftablifhed a claim, not only to exemption from rapine, but to the moft grateful acknowledgments.

The free-booter, like the pirate, is an outlaw among all the civilized nations of the world, and when in the power of any, ought, on no confideration, to experience the fmalleft portion of lenity. Men inured, as they conftantly are, to the perpetration of the moft barbarous deeds, and who confider the univerfe to be their property, can never be reclaimed: confequently humanity, as well as policy, dictates, that a war of extermination fhould be carried on againft them. We fpeak of this as alluding to profeffed banditti, obferving that in the bofom of every nation with which we are acquainted a gang of free-booters will be found, whether under the defignation of gypfies, or under the more common title of paupers, to infeft various parts, where, owing to local circumftances, they are too often more than tolerated. The perfon who may propofe an efficient remedy for this evil will richly deferve the thanks of his country.

Free *Bord, franc bord.* In fome places three feet, in others more, and in others lefs, is claimed by way of free bord, beyond or without the fence.

"Et totum bofcum, quod vocatur brendewode, cum franc bordo duorum pedum & dimid. per circuitum illius bofci." Mon. Ang. 2d part, fol. 241.

Free *Chapel*, is a chapel founded by the king, and by him exempted from the jurifdiction of the ordinary. See Chapel.

A fubject may alfo be licenfed by the king to build fuch a chapel, and by his charter may exempt it from the vifitation of the bifhop, &c.

Free *Coals*, are fuch as do not crozle or cement together in the burning, but remain in feparate lumps.

Free or *Imperial Cities*, in Germany, are thofe not fubject to any particular prince; but governed, like republics, by their own magiftrates.

There were free cities, *liberæ civitates*, even under the ancient Roman empire: fuch were thofe to which the emperor, by the advice or confent of the fenate, gave the privilege of appointing their own magiftrates, and governing themfelves by their own laws. See City.

Free *Fair*. See Fair.

Free *Fee*. See Fee and Frank.

Free *Fifhery*. See Fishery.

Free *Martin*, in *Rural Economy*, a term fignifying a barren heifer that has been a twin with a bull-calf.

Free-*mafon*. See Mason.

Free *Port*. See Port.

Free *Service*. See Service.

Free *Socage*. See Socage.

Free *State*, is a republic governed by magiftrates elected by the free fuffrages of the inhabitants.

Free-*ftone*, a whitifh ftone, dug up in many parts of England, that works like alabafter; but is more hard and durable, being of excellent ufe in building, &c.

It is a kind of the gritt ftone, but finer fanded, and a fmoother ftone; and is called free-ftone, from its being of fuch a conftitution as to be cut freely in any direction. This is a fpecies of the pfaduria of Hill.

The qualities of the feveral kinds of free-ftone, in common ufe in the feveral parts of Europe, are very different. They all agree in this general property indeed, that they are fofter while in the quarry than when they have been fome time expofed to the air: but even this general property differs greatly in degree. They have a fort of grey free-ftone in ufe at Paris, of which we do not feem yet to have met with any quarries in England, though probably enough there are fuch, which has this property in fo eminent a degree, that the expence of working it is in a great meafure faved.

This ftone lies every where on the fouth fide of the river Seine, and is of a coarfe and large gritt. It is fo foft when newly taken out of the ftrata, that they cut it very conveniently with a fort of broad axe, and fafhion as many ftones for building in this manner in an hour, as an equal number of our people do in a day or two. Though this ftone is as foft as dry clay when firft taken up, it is found to harden fo confiderably in the air, that it becomes more than equal to our ordinary free-ftone.

Our Portland ftone, of the fineft kind, which is white, and of a clofe gritt, is very fit for hewing or carving, but it will neither refift water nor fire, which is a very fingular circumftance in fo denfe a ftone; while the free-ftone of Kent, which is lefs beautiful to the eye, and is of a greyifh colour, and confiderably clofe, though of a larger grain, refifts the air and water very well.

The free-ftone of Derbyfhire, on the other hand, is fo brittle as to be unfit for any fine working, and fo coarfe and open in its texture that it lets water through; yet it bears the fire extremely well, and is fit for ovens, hearths, &c. Phil. Tranf. N° 93.

Free *Stool*. See Fridstoll.

Free-*thinker*. See Deist.

Free-*warren*. See Warren.

Free-*will*. See Will.

FREE-BOOTER's Point, in *Geography*, a cape at the weftern extremity of the ifland of Anagada in the Weft Indies.

FREEDOM, the quality or ftate of being free. See Free.

Freedom *of a City, Town*, &c. denotes a right or capacity of exercifing a certain trade or employment in that city or town corporate, and of being elected to the dignities and offices thereof. It is procured regularly, by ferving an apprenticefhip; but fometimes purchafed with money, and fometimes conferred as a favour or compliment.

Freedom *of the Will*, a ftate or faculty of the mind, wherein all the motions of our will are in our power, and we are enabled to determine on this or that; to do good or evil, without any force or conftraint from any external caufe whatever. See Liberty, and Necessity.

Freedom *of Confcience*. See Liberty, and Toleration.

The fchoolmen diftinguifh two kinds of this freedom, *viz.*

Freedom *of Contradiction*, whereby we are at our choice to will, or nill; to love, or not to love, &c.

Thus, if I give my friend a power to take my horfe, that friend has freedom of contradiction with refpect to the horfe; fince it is in his own power either to ufe him, or let him alone.

Freedom *of Contrariety*, or of *Contraries*, is that whereby we

we are at our choice to do good or evil, to be virtuous or vicious.

Thus, if I offer my friend a horfe, or a lion, and give him his option of the two, he is faid to have a liberty of contrariety over the horfe and lion.

But the logicians charge this as a faulty or unartful divifion, becaufe one member of the divifion is contained in the other, as a fpecies in the genus; for whatever is free, in refpect of contradiction, is alfo free in refpect of contrariety, though not *vice versâ*: for if it be free for my friend to take the horfe, or the lion, it is alfo free for him to let them both alone; but he may be free to take one of them, without a freedom of chufing which to take.

Yet the diftinction is of fome ufe; as it intimates, that the will is not always poffeffed of both kinds of freedom, and that the matter or fubject of the two is different.

The will, though it fhould be allowed to be free, has not a liberty of contrariety: thus, any evident truth being propofed to the mind, *e. gr.* that the whole is greater than a part, though we may have a power of not affenting thereto, by diverting our attention to fomething elfe, yet we have not a power of diffenting from that propofition, and judging that the whole is not greater than the part.

Hence moralifts commonly hold, that with refpect to the fupreme good, man has a liberty of contradiction, inafmuch as he may abftain from the love or purfuit thereof; but he has not a liberty of contrariety, whereby to hate goodnefs.

Add, that though the human mind may have a freedom of contradiction with refpect to all objects, even the fupreme good itfelf; yet the freedom of contrariety is reftrained to certain particulars, which either are, or appear to be good; the will having fuch a natural propenfity to be good, that it cannot defire evil, but under the notion and appearance of good.

FREEDOM *of Thinking*. See DEISM.

FREEHOLD, in *Geography*, a poft town of America, in Monmouth county, New Jerfey; 15 miles W. of Shrewfbury, and 20 S. E. by S. of New Brunfwick. Freehold has an academy, and, in 1790, contained 3785 inhabitants.

FREEHOLD, *Upper*, a townfhip of New Jerfey, in Monmouth county, W. of Freehold. In 1790, it contained 3442 inhabitants.

FREEHOLD, a poft town in Green county, New York, containing 3812 inhabitants.

FREEHOLD, *Frank Tenement, liberum tenementum*, in *Law*, is land, or tenement, which a man holds in fee-fimple, fee-tail, or for term of life. (Bract. l. ii. c. 9.) An eftate of freehold is defined by Britton (c. 32.) to be "the poffeffion of the foil by a freeman." And St. Germyn (Dr. and Stud. b. 2. d. 22.) tells us, that "the poffeffion of the land is called in the law of England the frank tenement or freehold." Such eftate, therefore, and no other, as requires actual poffeffion of the land is, legally fpeaking, *freehold*; which actual poffeffion can by the courfe of the common law be only given by the ceremony called "livery of feifin," which is the fame as the feodal inveftiture. From thefe principles, fays judge Blackftone, we may extract this defcription of a freehold: that it is fuch an eftate in lands as is conveyed by livery of feifin, or, in tenements of an incorporeal nature, by what is equivalent thereto. Accordingly it is laid down by Littleton (f. 59.) that where a freehold fhall pafs, it behoveth to have livery of feifin. As therefore eftates of inheritance, and eftates for life, could not, by common law, be conveyed without livery of feifin, thefe are properly eftates of freehold; and as no other eftates were conveyed with the fame folemnity, therefore no others are properly freehold eftates. See ESTATE.

Freehold is of two kinds, in *deed*, and in *law*. The firft is the real poffeffion of land or tenement in fee, fee-tail, or for life: the other is the right a man has to fuch land or tenement before his entry or feizure.

A freehold, by the common law, cannot commence *in futuro*, but it muft take effect prefently, either in poffeffion, reverfion, or remainder. (5 Rep. 94.) Whatever is part of the freehold goes to the heir; and things fixed thereto, as glafs windows, wainfcot, &c. cannot be removed by tenants, nor taken in diftrefs for rent, or in execution, &c. No man fhall be diffeifed of his freehold by ftat. Magna Charta, cap. 29. but by judgment of his peers, or according to the laws of the land: nor fhall any diftrain freeholders to anfwer for their freehold, in any thing concerning the fame, without the king's writ. (Stat. 52 Hen. III. c. 22.) Freehold eftates of certain value are required by ftatutes to qualify jurors, electors of the knights of the fhire in parliament, &c.

For the method of finding the value of freehold eftates, fee ANNUITIES and LIFE-ANNUITIES.

FREEHOLD is likewife extended to fuch offices as a man holds in fee, or for life.

FREEHOLD is alfo fometimes taken in oppofition to villenage.

Lambard obferves, that land, in the Saxons' time, was diftinguifhed into bockland, *i. e.* holden by book, or writing; and folkland, held without writing.

The former, he fays, was held on far better condition, and by the better fort of tenants, as noblemen and gentlemen; and being fuch as we now call freehold; the latter was moftly in poffeffion of peafants; being the fame with what we now call "at the will of the lord."

In the ancient laws of Scotland, freeholders are called *milites*, knights. In Reg. Judicial, it is expreffed, that he who holds land upon an execution of a ftatute-merchant, until he hath fatisfied the debt, "tenet ut liberum tenementum fibi et affignatis fuis;" and the fame of a tenant per elegit; the meaning of which feems to be, not that fuch tenants are freeholders, but as freeholders for the time, till they have received profits to the value of their debt.

FREEING *a* MINE, is paying the firft difh of ore obtained therefrom to the farmer of the king's dues in the king's field.

FREELS, CAPE, in *Geography*, a cape on the eaft coaft of Newfoundland. N. lat. 49° 35′. W. long. 53° 10′.

FREEMONT, a cape on the north coaft of the ifland of Jerfey; 5 miles N. of St. Helier.

FREEPORT, a poft-town of America, in Cumberland county, Maine, at the head of Cafco bay; adjoining to Durham on the N.E. and to North Yarmouth on the S.W.; 10 miles N.E. of Portland, and 140 N. by E. of Bofton: it was incorporated in 1789, and contains 1330 inhabitants. A mine of filver and lead, it is faid, has been difcovered in this town.

FREETOWN, a thriving townfhip in Briftol county, Maffachufets, incorporated in 1683, containing 2535 inhabitants, and lying 45 miles foutherly of Bofton. The fouthern part of this town has been lately incorporated into a new town, by the name of Fall River.

FREEWILL'S ISLANDS, three fmall iflands in the Eaft Indian fea, difcovered by Capt. Carteret in the year 1767: called

called refpectively, Pegan, Onata, and Onella. They are wholly furrounded by a reef of rocks, except towards the eaft, where is a paffage for a canoe. Pegan is fituated about two miles north from the other two, which lie near each other in an eaft and weft direction. The inhabitants were friendly, and ready to exchange their cocoa nuts for fmall pieces of iron, which they valued highly. They are of the Indian copper colour, with fine long black hair, and fmall beards, which they were continually plucking by the roots from their chin and upper lip. Their features are pleafing, and their teeth remarkably white and even; they are of the common ftature, but fingularly nimble, active, and vigorous. Their difpofition is free and open, and they affociated with the crew as familiarly as if they had been long acquainted. On their waift they had a flight covering, which confifted of fine matting. Their canoes are well conftructed, having a hollow tree for the bottom, and planks for the fides, with a fail of fine matting, and an outrigger, and good ropes and netting. One of the inhabitants infifted on remaining with the fhip's crew, who was named Jofeph Freewill, and from whom they learned that there were other iflands towards the north, whofe inhabitants had iron, and who always killed his countrymen when they met at fea. The iflands were fmall and low, the larger not being more than five miles in compafs, to which the captain gave the name of Freewill ifland. S. lat. 0° 50'. E. long. 137° 51'.

FREEZE, in *Architecture*, the middle fubdivifion of the entablature, feparating the cornice from the architrave.

The ancients called it *zoophorus*, ζωοφορος, becaufe it was ufually enriched with figures of animals; and our denomination freeze has a like origin, being formed of the Latin *phrygio*, an embroiderer, becaufe it is commonly adorned with fculptures in baffo relievo, imitating embroidery.

The freeze is fuppofed to be intended to reprefent the heads of the tranfverfe beams that fuftain the roof or covering.

In the Tufcan order, the freeze is a plain flat member; in the Doric it is ornamented with tablets, which are cut into vertical, triangular grooves called triglyphs; and in the Ionic and Corinthian it is a plane furface; that of thofe in the latter order is fometimes enriched. The peculiarities refpecting the freeze will be feen under the head of each individual order. See alfo COLUMN.

From the variety of enrichments practifed on the freezes, they become varioufly denominated: as,

FREEZES, *Convex*, or *Pulvinated*, are thofe whofe profile is a curve; the beft proportion whereof is, when drawn on the bafe of an equilateral triangle.

In fome, the fwelling is only at the top, as in a confole; in others at bottom, as in a baluster.

FREEZES, *Flourifhed*, are thofe enriched with rinds or imaginary foliages, as the Corinthian freeze of the frontifpiece of Nero; or with natural leaves, either in clufters or garlands, or continued, as in the Ionic of the gallery of Apollo in the Louvre.

FREEZES, *Hiftorical*, are thofe adorned with baff-relievos, reprefenting hiftories, facrifices, &c. as that of the arch of Titus at Rome.

FREEZES, *Marine*, are thofe reprefenting fea-horfes, tritons, and other attributes of the fea; or fhells, baths, grottos, &c.

FREEZES, *Ruftic*, are thofe whofe courfes are rufticated, or imboffed; as the Tufcan freeze of Palladio.

FREEZES, *Symbolical*, are thofe adorned with the attributes of religion; as the Corinthian of the temple behind the Capitol at Rome, whereon are reprefented the inftruments and apparatus of facrifice.

FREEZE *of the Capital*. See HYPOTRACHELION.

FREEZE, in *Commerce*, a kind of cloth or ftuff. See FRIZE.

FREEZELAND PEAK, in *Geography*, a fmall ifland in the South Atlantic ocean, near the coaft of Sandwich land, fo called from one of Capt. Cook's crew, who difcovered it in the year 1775. S. lat. 59°. W. long. 27°.

FREEZELAND, *Friezeland*, or *Frizeland*, *horfe*, in *War*, the fame with *cheval de frife*.

FREEZING, denotes that operation in nature, by which a liquid, as water, is converted into a folid form, as ice. It is effected by the abftraction of heat from the liquid body, but how this fhould produce a change in the form or conftitution of the body, remains ftill a fubject for enquiry. It may be imagined that cold is fomething pofitive, which infinuates itfelf into the pores of the liquid, and obftructs the free motion of its particles; but this would require the body to increafe in weight; or, if we fuppofe cold to be void of gravity, ftill it fhould tend to increafe the volume of the liquid; it however generally produces the contrary effect. Some have fuppofed that the heat of bodies being diminifhed, their particles are brought more nearly into contact, and thus the attraction of aggregation or cohefion is increafed; but in the cafe of water and ice, which is the moft familiar inftance we have, the very reverfe takes place; namely, the congealed body, ice, is of lefs denfity than the liquid; and what renders it ftill more remarkable is, that before the tranfition from liquidity to folidity, a gradual expanfion is obferved in the liquid itfelf during fome degrees of defcending temperature. More lately it has been fuppofed that a kind of polarity actuates the molecules of liquids, and brings them, in certain cafes, to cohere more forcibly; but this does not account for the phenomena obferved in regard to change of volume.

Mr. Dalton, in his New Syftem of Chemical Philofophy, has given a fection on the phenomena of the congelation of water, which contains fome ingenious conjectures on the fubject. He ftates the principal facts of congelation as follows: "1ft. The fpecific gravity of ice is lefs than that of water, in the ratio of 92 to 100. 2d. When water is expofed in a large fufpended jar to cool in ftill air of 20° or 30°, it may be cooled 2° or 3° below freezing; but if any tremulous motion takes place, there appear inftantly a multitude of fhining hexangular fpiculæ, floating, and flowly afcending in the water. 3d. It is obferved, that the fhoots or ramifications of ice at the commencement, and in the early ftage of congelation, are always at an angle of 60° or 120°. 4th. Heat is given out during congelation, as much as would raife the temperature of water 140 or 150°. The fame quantity is again taken in when the ice is melted. This quantity may be $\frac{1}{3}$th of the whole heat which water of 32° contains. 5th. Water is denfeft at 36 of the old fcale, or 38° of the new: from that point it gradually *expands* by cooling or by heating alike, according to the law fo often mentioned, that of the fquare of the temperature. 6th. If water be expofed to the air and to agitation, it cannot be cooled below 32°; the application of cold freezes a part of the water, and the mixture of ice and water acquires the temperature of 32°. 7th. If the water be kept ftill, and the cold be not fevere, it may be cooled in large quantities to 25° or below, without freezing; if the water be confined in the bulb of a thermometer it is very difficult to freeze it by any cold mixture above 15° of the old fcale (Fahrenheit's); but it is equally difficult to cool the water much below that temperature without its freezing. I have obtained it

as low as 7° or 8°, and gradually heated it again without any part of it being frozen. 8th. In the last case of what may be called *forced* cooling, the law of expansion is still observed as given above. 9th. When water is cooled to 15° or below in a bulb, it retains the most perfect transparency; but if it accidentally freeze, the congelation is instantaneous, the bulb becoming in a moment opake, and white like snow, and the water is projected up the stem. 10. When water is cooled below freezing, and congelation suddenly takes place, the temperature rises instantly to 32°." He then proceeds as follows: "In order to explain these phenomena, let it be conceived that the ultimate or smallest elements of water are all globular, and exactly of the same size; let the arrangement of these atoms be in squares, as exhibited in *Plate* XIV. *Pneumatics*, *fig.* 4, so that each particle touches four others in the same horizontal plane. Conceive a second stratum of particles placed upon these in like order of squares, but so that each globule falls into the concavity of four others on the first stratum, and consequently rests upon four points, elevated 45° above the centres of the globules. A perpendicular section of such globule, resting upon two diagonal globules of the square, is exhibited in *fig.* 5. Conceive a third stratum placed in like manner upon the second, &c. the whole being similar to a square pile of shot.—The above constitution is conceived to represent that of water at the temperature of greatest density.

"To find the number of globules in a cubic vessel, the side of which is given; let n = the number of particles in one line or side of the cube, then n^2 is the number in any horizontal stratum, and because a line joining the centres of two contiguous particles in different strata makes an angle of 45° with the horizontal plane, the number of strata in the given height will be $n \div$ sin. of $45° = n \div \frac{1}{2}\sqrt{2}$. Whence the number of particles in the cubic vessel $= n^3 \div \frac{1}{2}\sqrt{2} = n^3\sqrt{2}$.

"Now let it be supposed that the square pile is instantly drawn into the shape of a rhombus, (*fig.* 6.) then each horizontal stratum will still consist of the same number of particles as before, only in a more condensed form, each particle being now in contact with six others. But to counteract this condensation, the several successive strata are more elevated than before, so that the pile is increased in height. A question then arises, whether a vessel of given capacity will hold a greater number of particles in this, or the former disposition? It must be observed that in the last case, each particle of a superior stratum rests only on two particles of an inferior one, and is therefore elevated by the sine of 60°, as represented in *fig.* 7. The basis of the two piles are as $1 : \sqrt{\frac{3}{4}}$, and their heights as $\sqrt{\frac{1}{2}} : \sqrt{\frac{3}{4}}$; but the capacities are as the products of the base and height, or as $\sqrt{\frac{1}{2}} : \frac{3}{4}$; that is, as .707 to .750 nearly; or as 94 to 100. Thus it appears that the first arrangement contains more particles in a given space than the second, by 6 *per cent.*

"The last or rhomboidal arrangement is supposed to be that which the particles of water assume upon congelation. The specific gravities of ice and water should therefore be as 94 to 100. But it should be remembered that water usually contains 2 *per cent.* in bulk of atmospheric air; and that this air is liberated upon congelation, and is commonly entangled among the ice in such sort as to increase its bulk without materially increasing its weight; this reduces the specific gravity of ice 2 *per cent.*, or makes it .92, which agrees exactly with observation. Hence the 1st fact is explained.

"The angle of a rhombus is 60°, and its supplement 120°; if any particular angles are manifested in the act of congelation, therefore, we ought to expect these, agreeable to the 2d and 3d phenomena.

"Whenever any remarkable change in the internal constitution of any body takes place, whether by the accession and junction of new particles, or by new arrangements of those already existing in it, some modifications in the atmospheres of heat must evidently be required; though it may be difficult to estimate the quantity, and sometimes even the kind of change so produced, as in the present case. So far therefore the theory proposed agrees with the 4th phenomenon.

"In order to explain the other phenomena, it will be requisite to consider more particularly the mode by which bodies are expanded by heat. Is the expansion occasioned simply by the enlargement of the individual atmospheres of the component particles? This is the case with elastic fluids, and perhaps with solids, but certainly not with liquids. How is it possible that water should be expanded a portion represented by 1 upon the addition of a certain quantity of heat at one temperature, and by 340 upon the addition of a like quantity at another temperature, when both temperatures are remote from the absolute zero, the one perhaps 6000° and the other 6170°? The fact cannot be accounted for on any other supposition than that of a change of arrangement in the component particles; and a *gradual* change from the square to the rhomboidal arrangement, is in all probability effected both by the addition and abstraction of heat. It is to be supposed then, that water of the greatest possible density has its particles arranged in the square form; but if a given quantity of heat be added to, or taken from it, the particles commence their approach to the rhomboidal form, and consequently the whole is expanded, and that the same, by the same change of temperature, whether above or below that point.

"If heat be taken away from water of 38°, then expansion is the consequence, and a moderate inclination of the particles towards the rhomboidal form; but this only extends a small way, whilst the mass is subject to a tremulous motion, so as to relieve the obstructions occasioned by friction; by the energy of certain affinities, the new form is completed in a moment, and a portion of ice formed; heat is then given out, which retards the subsequent formation, till at last the whole is congealed. This is the ordinary process of congelation. But if the mass of water cooled is kept in a state of perfect tranquillity, the gradual approach to the rhomboidal form can be carried much farther; the expansion goes on according to the usual manner, and the slight friction or adhesion of the particles is sufficient to counteract the balance of energies in favour of the new formation, till some accidental tremor contributes to adjust the equilibrium. A similar operation is performed when we lay a piece of iron on a table, and hold a magnet gradually nearer; the proximity of the approach, without contact, is much assisted by guarding against any tremulous motion of the table. Hence the rest of the phenomena are accounted for."

It has been observed that freezing and crystallization are phenomena of the same kind. When salts crystallize, they usually contain certain invariable proportions of water. The same remark applies to certain acids which congeal when diluted to a certain degree; thus, sulphuric acid 1.78, specific gravity, congeals about 32°, but does not melt under 45°; whereas an acid more or less diluted does not freeze without much greater cold, and when partially frozen, the ice is found to approximate to the strength of 1.78, leaving the unfrozen liquid somewhat weaker or stronger, according to the circumstances of the case. Nitric acid of 1.30 specific gravity freezes at —2°, according to Mr. Cavendish, and no

other strength will freeze at so high a temperature. From this conclusion however, we must be understood to except very dilute acid, such as to be almost entirely water. This acidulous water freezes with a less degree of cold, and is separated into two portions, the most watery part freezing first, and afterwards the most acid part. This has been called the *aqueous* congelation of the acids. The temperatures at which very dilute acids freeze have been ascertained by sir Charles Blagden as under. (Philos. Transact. 1788.) The sulphuric acid was of the density 1.837, and the nitric acid 1.454. To 100 parts of water by weight were added certain weights of the above acids, and the temperatures at which the mixtures froze were observed.

Sulphuric acid.

Water.		Acid.	Freezing point.
100	+	10	24°.5
100	+	20	12°.5
100	+	25	7°.5

Nitric acid.

Water.		Acid.	Freezing point.
100	+	10	22°
100	+	20	10°.5
100	+	23.4	7°.

It appears also from sir Charles Blagden's experiments, that various salts dissolved in water contribute to lower the freezing point; and that the effect of the same salt is in proportion to its quantity. To 100 parts of water, by weight, were added parts of the different salts as under, and the freezing points of the solutions found.

Names of salts.	Proportion.	Freezing point.
Common salt	25	4°
Sal ammoniac	20	8°
Rochelle salt	50	21°
Sulphate of magnesia	41.6	25°.5
Nitre	12.5	26°.
Sulphate of iron	41.6	28°.
Sulphate of zinc	33.3	28°.6

These solutions may be cooled below their respective freezing points, the same as water; and the contact of ice in such case sets the congelation a going. It is remarkable also, that the expansion of these solutions by heat is very different from that of pure waters, especially in the lower temperatures. For other particulars see CONGELATION, &c.

FREEZING *Mixtures*. In prosecuting chemical and other inquiries, it is sometimes requisite to subject bodies to a greater degree of cold than the ordinary changes of temperature in the atmosphere allow. A reduction of temperature is effected by the chemical union of certain bodies; or, to speak more properly, by the solution of one body in another. Salts dissolved in water, ice or snow dissolved in nitric and muriatic acids, reduce the temperature of the mixtures a great number of degrees. The cause is, the mixture has a larger capacity for heat than would be derived from blending the two capacities of the ingredients, and taking a mean; but this subject will be discussed more properly under the heads of CALORIC, HEAT, &c.

Fahrenheit seems to have been the first who made any number of experiments directed to this point. The zero of his thermometrical scale is derived from the cold which a mixture of equal parts of snow and common salt produces; and his 32°, or freezing point, is the temperature of a mixture of ice or snow and water. Mr. Walker of Oxford has prosecuted this investigation farther than any other person. The results of his experience are given in two papers in the Philosophical Transactions for 1795 and 1801. One principal object he had in view, was to exhibit the congelation of quicksilver without great natural cold. He succeeded so far as to freeze it even in the summer, though it requires the temperature of — 39° at least to congeal that metal. Professor Lowitz of Petersburgh, in 1796, published some interesting experiments on the subject of frigorific mixtures, which may be seen in the Annales de Chimie, tome 22, for 1797. Fourcroy, Vauquelin, and Guyton, gave memoirs on the effects of frigorific mixtures in the 29th volume of the same work, which contains many facts deserving attention. Lowitz's great improvement was in the introduction of muriate of lime, an article which unites almost all the desirable properties of an ingredient in such mixtures. It produces the greatest degree of cold, is cheap in the first instance, and easily recovered for further use, and is not corrosive. By means of this article and snow, or pounded ice, very large quantities of mercury have been frozen. In 1793 Lowitz froze 12lbs. of mercury at Petersburgh; and in 1799 Mr. W. H. Pepys of London, assisted by some philosophical acquaintance, froze 56lbs. of mercury; an account of which may be seen in the 3d vol. of the Philosophical Magazine. Mercury in freezing assumes the crystalline form, and contracts in its dimensions, according to Mr. Cavendish, $\frac{1}{23}$d of its volume, but according to Mr. Biddle, it amounts to $\frac{1}{7}$th of the volume.

The following table gives the most complete and accurate list of freezing mixtures and their effects, that we yet have. They are the results of Mr. Walker's experience.

Table of Freezing Mixtures.

Mixtures.		Thermometer sinks.
Muriate of ammonia - 5 parts Nitre - 5 Water - 16		From 50° to 10°.
Muriate of ammonia - 5 parts Nitre - 5 Sulphate of soda - 8 Water - 16		From 50° to 4°.
Nitrate of ammonia - 1 part Water - 1		From 50° to 4°.
Nitrate of ammonia - 1 part Carbonate of soda - 1 Water - 1		From 50° to — 7°.
Sulphate of soda - 3 parts Diluted nitric acid - 2		From 50° to — 3°.
Sulphate of soda - 6 parts Muriate of ammonia - 4 Nitre - 2 Diluted nitric acid - 4		From 50° to — 10°.
Sulphate of soda - 6 parts Nitrate of ammonia - 5 Diluted nitric acid - 4		From 50° to — 14°.
Phosphate of soda - 9 parts Diluted nitric acid - 4		From 50° to — 12°.
Phosphate of soda - 9 parts Nitrate of ammonia - 6 Diluted nitric acid - 4		From 50° to — 21°.
Sulphate of soda - 8 parts Muriatic acid - 5		From 50° to — 0°.

Sulphate

Mixtures.		Thermometer ſinks
Sulphate of ſoda	5 parts	From 50° to 3°.
Diluted ſulphuric acid	4	
Snow	1 part	From 32° to 0°.
Common ſalt	1	
Muriate of lime	3 parts	From 32° to − 50°.
Snow	2	
Potaſh	4 parts	From 32° to − 51°.
Snow	3	
Snow	1 part	From − 20° to − 60°.
Diluted ſulphuric acid	1	
Snow or pounded ice	2 parts	From 0° to − 5°.
Common ſalt	1	
Snow	3 parts	From 0° to − 46°.
Diluted nitric acid	2	
Muriate of lime	2 parts	From 0° to − 66°.
Snow	1	
Snow or pounded ice	1 part	From − 5° to − 18°.
Common ſalt	5	
Muriate of ammonia and nitre	5	
Snow	2 parts	From − 10° to − 56°.
Diluted ſulphuric acid	1	
Diluted nitric acid	1	
Snow or pounded ice	12 parts	From − 18° to − 25°.
Common ſalt	5	
Nitrate of ammonia	5	
Muriate of lime	3 parts	From − 40° to − 73°.
Snow	1	
Diluted ſulphuric acid	10 parts	From − 68° to − 91°.
Snow	8	

For more particulars in regard to the hiſtory of the congelation of mercury, ſee Mercury.

A little experience will ſuggeſt ſome of the precautions neceſſary to enſure ſucceſs in theſe mixtures. The ſalts ſhould be cryſtallized, but reduced to a fine powder. The water of cryſtallization, probably exiſting in a ſtate reſembling ice, ſeems to perform an important part of the cooling effect. It is therefore needful that ſalts liable to efferveſcence, ſuch as the ſulphate and phoſphate of ſoda, ſhould be freſh cryſtallized, or kept from the action of the air; the muriate of lime, and other deliqueſcent ſalts, ſhould be cryſtallized, then pulverized, paſſed through a ſieve, and bottled cloſe, to prevent the acceſs of air. Mr. Walker informs us that muriate of lime of 1.45 ſpecific gravity will cryſtallize at the temperature of 32°, and is therefore beſt to uſe for that temperature; but for uſe in warm weather, he recommends boiling the liquid down to 1.49 ſpecific gravity at the temperature of 80°, cryſtallizing, pounding, and bottling, &c. The veſſels containing the frigorific mixtures ſhould be thin, and juſt large enough to hold them. Tinned iron will do well where no acids are employed. The ingredients ſhould be mixed as quickly as poſſible. When great cold is to be produced, the ingredients are to be ſeparately cooled in other freezing mixtures; thus they may be reduced to 0° by a mixture of ſnow and common ſalt. The thermometers uſed on theſe occaſions are made of ſpirit of wine or alcohol. The potaſh in the above table is cauſtic potaſh cryſtallized; and the diluted acids are the common acids of the ſhops diluted with equal weights of water. It is to be regretted that Mr. Walker has not rather given us the ſpecific gravities of the ſeveral acids uſed, as their ſtrengths as articles of commerce are known to be variable.

The beſt and moſt convenient of the above mixtures, when great frigorific effects are to be produced, is muriate of lime and ſnow. But when a reduction of 15° or 20° of temperature is only wanted, equal parts of nitre and ſal ammoniac, in the proper proportion of water, are found moſt advantageous, as the ſalts are eaſily recovered by evaporation.

It is remarkable that none of the above mixtures reduces the temperature of the ingredients above 83°. But in mixtures producing heat or increaſe of temperature, we have an elevation of 200° by ſulphuric acid and water mixed in due proportion; and a ſtill greater elevation is obſerved in mixing lime and water. This would ſeem to indicate that our preſent method of reckoning degrees of temperature is probably wrong; that the lower degrees are much too large, and conſequently too few in number. If the idea of Mr. Dalton be confirmed, that the freezing point of mercury at − 39° or − 40° of our thermometer, that is, at 72 below the freezing point of water, be really 200° below the ſaid point, when the degrees are duly appreciated, this remarkable circumſtance, of leſs cold than heat being obtained from chemical mixtures, will vaniſh.

Freezing *Apparatus*, is a very ſmall apparatus contrived by Mr. Cavallo for freezing a ſmall quantity of water, *viz.* about 10 grains, in every climate. The whole apparatus is contained in a box $4\frac{1}{2}$ inches long, 2 inches broad, and $1\frac{1}{2}$ deep. The apparatus, and method of uſing it, are repreſented in *Plate* XIV. *Pneumatics*, *fig.* 8. E F G is a common phial with a glaſs ſtopple, filled with ether; E D is a glaſs tube with a capillary aperture at D, and having ſome thread wound round the other extremity for the purpoſe of fitting the neck of the bottle when the experiment is to be performed. A B is a glaſs tube about four inches long, and about $\frac{1}{5}$th of an inch in diameter, hermetically cloſed at B. Into this tube a ſlender wire H is introduced, the lower extremity of which is ſhaped into a ſpiral, and ſerves to draw out the ice when formed. When a little water, C B, is put into the tube, the operator holds the tube by its upper part, with the fingers of the left hand, and keeps it continually, but gently, turning round its axis, firſt one way, and then the other; whilſt with the right hand he holds the phial in ſuch a manner as to direct the ſtream of ether, which comes out of the capillary aperture D, towards the outſide of the tube, a little above the ſurface of the water within. The ſtream of ether ſhould be ſuch as that a drop of it may, now and then, (*e. g.* every ten ſeconds) fall from the under part of the thermometer. By continuing this operation during two or three minutes, the water C B will be frozen, and may be drawn out of the tube in one hard lump of ice. When this is done, the phial is turned with its aperture upwards, the ſhort tube E D is removed, the ſtopple is placed in its ſtead, and the remaining ether is preſerved for other trials.

Freezing *Rain*, or *Raining Ice*, is a very uncommon kind of ſhower, which fell in the weſt of England, in December, anno 1672. See Phil. Tranſ. N° 90.

This rain, as ſoon as it touched any thing above ground, as a bough, or the like, immediately ſettled into ice; and, by multiplying and enlarging the icicles, it broke all down with its weight. The rain that fell on the ſnow immediately froze into ice, without ſinking in the ſnow at all.

It made an incredible deſtruction of trees, beyond any thing in

in all hiftory. "Had it concluded with fome guft of wind," fays a gentleman on the fpot, "it might have been of terrible confequence."

"The fprig of an afh-tree, of juft three quarters of a pound, being weighed, the ice thereon weighed fixteen pounds. Some were frighted with the noife in the air; till they difcerned it was the clatter of boughs dafhed againft each other." Dr. Beale obferves, that there was no confiderable froft obferved on the ground during the whole; whence he concludes, that a froft may be very fierce and dangerous on the tops of fome hills; while, in other places, it keeps at two, three, or four feet diftance above the ground, rivers, lakes, &c. and may wander about, very furioufly in fome places, and be remifs in others, not far off. This froft was followed by glowing heats, and a wonderful forwardnefs of vegetation.

Freezing *of Wines*. See *Condenfing of* Wines.

Freezing, in *Commerce* and *Manufactures*. See Frizing.

Freezing, in *Sea Language*, is a fort of ornamental painting on the upper part of a fhip's quarter, ftern, or bow. It generally confifts of armour, inftruments of war, marine emblems, &c.

FREGAROLA, in *Ichthyology*, a name given by many to a fmall river-fifh, well known in England by the name of the minow.

FREGATA, in *Ornithology*, a fpecies of *procellaria*, which fee.

Fregata, or *Frigata*, a name given to the Pelecanus *aquilus*, which fee.

FREGELLANUM, or Fregella, in *Ancient Geography*, a town of Italy, in Latium, S.E. of Anagnia, on the Latin way. D'Anville places it to the right of the Liris; but the abbé Chauppy thinks the fituation was that of Opio, a corruption, as he conceives, of the name Opimius, a Roman conful, who deftroyed Fregella; Fregellanum having been built on its ruins.

FREGENA, a town and colony of Italy, in Etruria, fituated on the fea-coaft.

FREGGIA, in *Ichthyology*, the name of a long anguilliform fifh of the tænia kind, more commonly called *cavagiro*. It is the Cepola *tænia*.

FREGIT Clausum. See Clausum.

FREHEL, Cape, in *Geography*, a cape on the W. coaft of France; 12 miles W. of St. Malo. N. lat. 48° 38'. W. long. 2° 13'.

FREHER, Marquard, in *Biography*, an eminent jurift and man of letters, was born at Augfburg in the year 1565. He was educated for the profeffion of the law, firft at Altdorff and then at Bourges. His firft office was that of counfellor to the elector-palatine, John Cafimir, and in 1596 he obtained the profefforfhip of the law in the univerfity of Heidelberg. By the elector Frederic IV. he was employed in various important concerns, and created vice-prefident of the fenate. He was a very diftinguifhed negociator, but did not, by engaging in diplomatic concerns, neglect his literary purfuits, which were particularly directed to hiftory and antiquities. He was author of many learned works: of thefe the principal is, "De re monetaria veterum Romanorum, et hodierni apud Germanos Imperii Liber." He was a collector of ancient paintings, and poffeffed a well chofen cabinet of medals, many of which he elucidated in his writings. He died at Heidelberg in the year 1614. Moreri.

FREIBURG, in *Geography*, a town of the duchy of Bremen; 16 miles N. of Stade.

FREIDDEG, a town of Auftria; 7 miles S.S.W. of Ips.

FREIDNAU, a town of the duchy of Stiria; 6 miles W. of Rakelfpurg.

FREJENAL, or Frexenel, a town of Spain, in the country of Seville; 47 miles N. of Seville.

FREIENHAGEN, a town of Germany, in the principality of Waldeck, on the Watter; 18 miles W. of Caffel. —Alfo, a town of Brandenburg, in the Mark of Prignitz; 69 miles N.W. of Berlin. N. lat. 53° 17'. E. long. 12° 27'.

FREIENSTEIN, a town of Germany, in the county of Erbach; 10 miles S. of Erbach.

FREIENWELDE, a town of Germany, in the duchy of Pomerania; 15 miles N.E. of Stargard. N. lat. 53° 36'. E. long. 15° 23'.

FREIGHT. See Fraight.

FREIMERSHEIM, in *Geography*, a town of France, in the department of Mont Tonnerre, taken by the French in 1794; 4 miles N.N.E. of Landau, and 12 S.W. of Spire.

FREIN, or Wranow, a town of Moravia, in the circle of Znaym; 8 miles W. of Znaym.

FREIND, John, in *Biography*, a celebrated phyfician, was born in 1675, at Croton, in Northamptonfhire, of which place his father was rector. He was educated at Weftminfter fchool, under Dr. Bufby, and was thence elected, in 1690, into Chrift-church college, Oxford. Here he was confiderably diftinguifhed by his claffical attainments, to which Dr. Aldrich gave teftimony, by felecting him, together with Mr. Foulkes, for the tafk of publifhing a Latin tranflation of the oration of Æfchines againft Ctefiphon, and of Demofthenes de Corona. Having for fome time purfued the ftudy of phyfic, he communicated to the Royal Society, in 1699, an account of a remarkable hydrocephalus, and in 1701 a relation of a fingular convulfive difeafe affecting two poor families in Oxfordfhire. In 1703 he publifhed a work, which immediately brought him into notice as a phyfiologift and phyfician, entitled, "Emmenologia, in qua fluxus muliebris menftrui phænomena, periodi, vitia, cum medendi methodo, ad rationes mechanicas exiguntur," Oxford, in 4to. In this work, which was favourably received, and went through feveral editions, in tranflations, on the continent, Freind adopted the principles of the mechanical fect of phyficians, which then flourifhed under the aufpices of Baglivi, and other learned men. He confidered local plethora as the caufe of the evacuation, and attributed its diminution or deficiency to a lentor of the blood, and a rigidity of the veffels, and its excefs to the oppofite condition of tenuity of the blood, and laxity of the veffels; whence his plan of cure was derived. In the year 1704 he was appointed profeffor of chemiftry at Oxford; and in his lectures he attempted, after the example of Keil, to explain the operations of this art, alfo upon mechanical principles. In the enfuing year, however, he accompanied the earl of Peterborough, in his expedition to Spain, in the quality of phyfician to the Englifh forces. He was abroad two years, and returned through Italy, vifiting Baglivi and Lancifi at Rome, by whom he was received with diftinction, his reputation having already reached that capital. On his return, in 1707, he was created doctor by diploma, and publifhed his chemical lectures in Latin, under the title of "Prælectiones Chymicæ in quibus omnes fere Operationes Chymicæ ad vera principia et ipfius naturæ leges rediguntur." Thefe lectures were nine in number, and were dedicated to fir Ifaac Newton. He was elected a fellow of the Royal Society in 1712; but in the fame year quitted London in order to accompany the troops

troops under the command of the duke of Ormond, into Flanders. On the conclusion of peace in the following year he returned to London, where he chiefly resided afterwards, and rose to high professional reputation. In 1716 he was received as fellow of the College of Physicians, and in that year published the first and third books of Hippocrates on epidemics, with the addition of a commentary on fevers, in nine parts, under the title of "Hippocratis de morbis popularibus liber primus et tertius: his accommodavit novem de Febribus Commentarios I. Freind M. D." This is a performance of great erudition, affording a perspicuous view of the practice of the Greek physicians, of which he was for the most part a zealous defender. He was attacked with unbecoming acrimony, on account of some observations made in these commentaries, relative to the advantages of purgative medicines in the secondary fever of confluent small pox, by Dr. Woodward, in a treatise entitled "The State of Physic and Diseases." To this Dr. Freind first opposed a ludicrous reply, in the name of a noted empiric, one Byfield. At length he thought proper to answer it seriously, in a letter addressed in Latin to Dr. Mead, with the title of "De Purgantibus in secundo Variolarum Confluentium febre adhibendis," 1719, 8vo.—This letter contains many valuable observations, deduced both from theory and practice, elegantly expressed, which contributed to establish the practice for which he contended. He passed through the offices of the college, and in 1720 delivered an Harveian oration, which was much applauded.

Hitherto Dr. Freind had confined himself to medical and philosophical pursuits with great reputation and success; but in 1722, for what reasons we know not, he was induced to engage in political life, and entered into parliament as burgess for Launceston. His connections were with the party at this time in opposition to the court; and as the times were critical, and his attachments warm, his conduct soon exposed him to suspicion. Bishop Atterbury's plot for the restoration of the Stuart family was the leading topic of this period; and when a motion was made against the prelate in the house of commons, Dr. Freind was among the speakers in his favour. As the circumstances of the time had given the ministry a pretext for the suspension of the habeas corpus act, several persons of consequence were committed to prison, among whom was our physician, charged with suspicion of high treason. The opposition suggested that the only ground for this was his parliamentary conduct; but Walpole declared privately to several persons, that there was positive proof of the blackest treason against him. This, however, (as in many instances of a similar kind,) was never brought forward; and, after a confinement in the Tower from March 15, 1723, to June 21st, of the same year, he was admitted to bail, his sureties being Dr. Mead, and three others of his brethren. He appeared at the king's bench in November following, and was finally discharged. For the honour of Dr. Mead, however, the mode in which his liberation was procured must not be omitted to be noticed. Being called to attend sir R. Walpole in sickness, that physician refused to undertake the cure of the minister until Dr. Freind was set at liberty. He afterwards made over to Dr. Freind 5000 guineas which he had received in fees from his (Dr. F.'s) patients. His mind was tranquil enough on this occasion to suffer him to employ his leisure in the Tower in drawing up a second Latin epistle to Dr. Mead, concerning the small-pox, entitled, "De quibusdam Variolarum generibus Epistola," 1723. During his confinement he also formed the plan of his great work, of which the first part appeared in 1725, and the second in 1726. This was entitled "The History of Physic from the Time of Galen to the beginning of the Sixteenth Century, chiefly with regard to Practice; in a Discourse written to Dr. Mead," in two volumes 8vo. This work was suggested by the Histoire de la Medecine of Daniel Le Clerc, which terminated with Galen, and to which Dr. Freind intended it as a kind of supplement. It is divided into three parts, in which the Greek physicians, the Arabians, and the moderns are respectively treated of. The author did not attempt a biography of the leading physicians, nor a minute analysis of their works, but only notes the peculiarities of each in point of theory and practice, occasionally interspersing his own observations. This work was much read, both at home and abroad, in translations, and continues to be a standard work. It was attacked, however, from several quarters. Sir Clifton Wintringham published, anonymously, a tract, entitled, "Observations on Dr. Freind's History of Physic, shewing some false representations of Ancient and Modern Physicians, by C. W. D. M." 1726. And the celebrated John Le Clerc made some animadversions upon it, in defence of his brother Daniel, in the "Bibliotheque Ancienne et Moderne," tome XXVI., chiefly in regard to some points of chronology. The controversy was maintained by the interference of several writers on both sides. The errors of Le Clerc, pointed out by Freind, are, however, acknowledged, as well as some mistakes of his censurer.

Whatever political suspicions might have fallen upon Dr. Freind in consequence of his connections, the stain of disaffection to the reigning family must be regarded as obliterated, by his appointment, on the accession of George II., to the office of physician to queen Caroline. He did not long, however, enjoy this honourable trust, for he died in July, 1728, in the fifty-second year of his age, much regretted by all; and the care which his sovereign afterwards extended to his widow and his son, evinced the esteem in which he had been held by that prince.

The Latin works of Dr. Freind were published by Dr. Wigan in a folio volume, London, 1733, together with a Latin version of the History of Physic, and a life of the author by that editor. Several foreign editions of the same collection have also been published. Eloy. Dict. Hist. Gen. Biog. Sprengel, Geschichte der Artzn.

FREINDORF, in *Geography*, a town of Austria, four miles S.E. of Tulla.

FREINSHEIM, John, in *Biography*, was born at Ulm in 1608. He studied at various German universities, and was patronized by Matthew Berneger. He improved every advantage of which he was possessed by incessant diligence, and carried his researches into every part of literature. His knowledge of the languages was very extensive, and comprehended not only those which are now dead, and which have acquired the title of learned, but likewise most of those in modern use. In 1634 he was invited to Metz to occupy the post of interpreter to the king's secretaries; here he continued three years, and returned and married the daughter of his patron, with whom he took up his residence. In 1642 he was appointed professor of politics and eloquence at Upsal; and after five years queen Christina engaged him, with a liberal salary, to act as her librarian and historiographer. In 1652 he was invited to Heidelberg by the elector Charles Lewis, and created electoral counsellor, and honorary professor of the university. In this situation, to which his talents and manners were admirably adapted, he cultivated an extensive correspondence with the learned throughout Europe, and was honoured with the friendship and esteem of many persons of rank. He died in 1660, at the age of fifty-two. As a critic he illustrated with learned

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commentaries, the Latin hiftorians Florus, Q. Curtius, and Tacitus, and compofed fupplements for the loft books of Livy. He was author of many Latin orations, poems, and differtations; and in his youth he wrote German poems, one of which introduced him to the notice of Berneger. Moreri.

FREINSHEIM, in *Geography*, a town of Germany, in the palatinate of the Rhine; 10 miles W.N.W. of Manheim.

FREIRE, DE ANDRADA, HYACINTH, in *Biography*, was born about the year 1597, at Beja in Portugal. He was educated at Coimbra, where he took the degree of doctor in canon law, and applied to the ftudy of theology. He likewife engaged in a political queftion of confiderable intereft at that time, and wrote a treatife, entitled "Portugal Reftaurado," in which he zealoufly maintained the right of the houfe of Braganza to the crown. When he had taken prieft's orders, he went to the court of Spain, and was patronized by the firft minifter of Philip IV. who conferred upon him a valuable abbacy in the province of Beira. The freedom with which he vindicated the rights of his country, deftroyed, in a fhort time, all his profpects of future advancement, and even brought him into fome perfonal danger. He declared to his patron, without referve, when the queftion was put to him, that the rights of the king of Spain to the crown of Portugal were thofe only of force and ufurpation, and having compofed a work in favour of the title of Catherine the duchefs of Braganza, an order was iffued for his arreft, but he fortunately efcaped to his abbey, and there continued a voluntary prifoner till the acceffion of John IV. to the crown of Portugal in 1640, by whom he was received with the diftinction and refpect that his patriotifm merited. He was offered the appointment of preceptor to the prince, which he declined, as he did the nomination to a bifhopric, forefeeing that the pope would probably refufe to confirm the election, faying that "he did not choofe to be a bifhop as players were kings and emperors." Diffatisfied with the manners and principles of the court, he retired in a few years to his abbey, with which he was equally difgufted, and on the death of his father he returned to Lifbon to fettle his family affairs, and continued there till his death in 1657. He was a frank, generous and upright character, liberal to the needy, and warmly attached to his friends, whom he defended and juftified in their abfence, but whofe faults he did not fpare when they were together. He was an elegant author, publifhed fome poems, which may be found in a collection printed at Lifbon under the title of "Fenix Renacida;" but his moft important work is "The life of Don John de Caftro," which is efteemed one of the beft compofed books in the Portuguefe language. Moreri.

FREISACH, in *Geography*, a town of Germany, in the duchy of Carinthia, belonging to the archbifhopric of Salzburg, fituated on the Metnitz; having a caftle, college, convent of Dominicans, and commandery of the Teutonic order; taken by the French in 1797; eight miles N. of St. Veit.

FREISCHBACH, a town of France, in the department of Mont Tonnerre, lately belonging to the palatinate of the Rhine; taken by the French in 1794; fix miles E.N.E. of Landau.

FREISHEIN, a town of Moravia, in the circle of Znaym; 20 miles W.N.W. of Znaym.

FREITAG, JOHN, in *Biography*, a phyfician, was born at Nieder Wefel, in the duchy of Cleves, on the 30th of October 1581. His relations were compelled, by the troubles of the times, to retire to Ofnaburg, and there young Freitag began his claffical ftudies. He was afterwards fent to Cologne, but was foon recalled by his parents from the fear that he might acquire principles, in that univerfity, contrary to thofe of the proteftant religion which they profeffed. After completing his claffical purfuits at Wefel, he commenced the ftudy of philofophy at Helmftadt; but his difpofition being early turned to medicine, as a profeffion, he ftudied at Roftock, afterwards returned to Helmftadt to attend the lectures of Duncan Liddell and of Francis Parcovius; he likewife derived much advantage from the lectures of the celebrated Meibomius, in whofe houfe he refided in the capacity of tutor to his fon, and therefore had frequent opportunities of converfing on the fubject of medicine with that able mafter. The progrefs of his improvement in this fcience was fo great, that permiffion was given to him of giving private lectures to the younger ftudents on the practice. He afterwards lectured in public as profeffor extraordinary; and in 1604, that is, at the age of 23 years, he obtained the ordinary profefforfhip in the univerfity, which office he filled during four years. At the end of this time he obtained his degree of doctor, and went to the court of Philip Sigifmund, duke of Brunfwick Lunenburg, and bifhop of Ofnaburg, who had appointed him his principal phyfician. About the year 1622, Erneft, duke of Holftein and earl of Schawenburg, offered him the fame office, with the addition of the chief medical profefforfhip in the univerfity which he had lately founded at Rinteln; but his patron would not permit him to accept it. This prince-bifhop dying in 1623, his nephew, duke Frederic Ulric, gave Freitag the option of being his chief phyfician, or of refuming his profefforfhip at Helmftadt. He continued at Ofnaburg, where the new bifhop retained him as his phyfician, and alfo appointed him one of his chamberlains. He alfo ferved his fucceffor in the fame capacity, but was difmiffed in 1631, on account of his refufal to become a catholic. He found protection and patronage, however, under Erneft Caffimir, count of Naffau, and the counts of Bertheim, who procured for him the vacant profefforfhip in the univerfity of Groningen. He fulfilled this new appointment with great reputation, and continued to diftinguifh himfelf by the fuccefs of his practice till the decline of his life, which was accelerated by a complication of maladies. Dropfy, gout, gravel, and fever terminated his exiftence on the 8th of February, 1641, in the 60th year of his age.

Freitag was a follower of the chemical fect, and alfo a partifan of the philofophy of the ancients, to which indeed he retained his attachment with fo much bigotry, that no efforts of his friends could ever prevail upon him to change his opinion. He publifhed feveral works. 1. "Noctes Medicæ, five de Abufu Medicinæ Tractatus," Francfort, 1616.—2. "Aurora Medicorum Galeno-chemicorum, feu de rectâ purgandi methodo è prifcis fapientiæ decretis poftliminio in lucem redacta," Ibid. 1630.—3. "Difputatio Medica de morbis fubftantiæ et cognatis quæftionibus, contra hujus temporis Novatores et Paradoxologos," Groningen, 1632.—4. "Difputatio Medica calidi innati effentiam juxta veteris Medicinæ & Philofophiæ decreta explicans, oppofita Neotericorum et Novatorum Paradoxis," Ibid. 1632.—5. "De Offis natura et medicamentis opiatis Liber fingularis, &c." Groningen 1632.—6. "Difputatio Medico-philofophica de Formarum origine," Groningen, 1663.—7. "Oratio panegyrica de perfona et officio Pharmacopæi," &c. Ibid, 1633.—8. "Detectio et folida Refutatio novæ Sectæ Sennerto-Paracelficæ," Amfterdam, 1636.

FREJUS, in *Geography*, a town of France, in the department of the Var, and chief place of a canton in the diftrict of Draguignan. The place contains 2229, and the canton 7797 inhabitants, in a territory of 497½ kiliometres, in 6 communes. This was formerly a confiderable place, called "Forum

"Forum Julii," and the birth-place of Agricola, but it is now a ſmall fortified town, containing a cathedral, a pariſh church, and 4 convents. Its ſituation is marſhy and inſalubrious to the left of the Argens, about half a league from the ſea-coaſt, 16 leagues N.E. of Toulon, and 12 N.W. of Nice. Its port is choaked up. Among the remains of antiquity are a Roman amphitheatre and an aqueduct. N. lat. 43° 25′ 52″. E. long. 6° 45′ 54″.

FREIXEL, a town of Portugal, in the province of Tra los Montes; 15 miles S. of Mirandela.

FREIXIERA, a town of Portugal, in the province of Entre Duero e Minho; ſeven miles N.E. of Amarante.

FREMONA, a town of Abyſſinia, in the kingdom of Tigré, where the Portugueſe miſſionaries took up their firſt reſidence; 50 miles N.E. of Siré. N. lat. 14° 40′. E. long. 38° 18′.

FREMONT, D'ABLANCOURT, NICHOLAS DE, in *Biography*, flouriſhed towards the cloſe of the 17th century. He was nephew of Perrot d'Ablancourt, who undertook the charge of his education, to which the young man did much credit by an early diſplay of his knowledge and great talents. In 1663 he was appointed envoy from France to the court of Portugal, and in 1675 reſident at Straſburg. After this he returned to France, and ſpent his time in ſtudy and in the ſociety of the learned. At the revocation of the edict of Nantes he was obliged to quit his country on account of his ſteady attachment to the Proteſtant cauſe. From the prince and princeſs of Orange he obtained a penſion as hiſtoriographer. He died in 1693. As an author he added to his uncle's tranſlation of Lucian, the dialogue between the letters of the alphabet, and the ſupplement to the true hiſtory. He publiſhed ſome elegant dialogues, and a French catechiſm. After his death appeared his "Memoirs concerning the hiſtory of Portugal, from the treaty of the Pyrenees to 1668." Moreri. Bayle.

FREMUR, in *Geography*, a river of France, which runs into the Engliſh channel. N. lat. 48° 35′. W. long. 2° 12′.

FRENCH, FRANÇOIS, abſolutely uſed, ſignifies the language of the people of France.

The French, as it now ſtands, is no original, or mother-language, but a medley of ſeveral: there is ſcarcely any language from which it has not borrowed words, or perhaps phraſes.

The languages that prevail moſt, and that are, as it were, the baſes thereof, are, 1. The Celtic; whether that were a particular language itſelf, or whether it were only a dialect of the Gothic, as ſpoke in the Weſt and North. 2. The Latin, which the Romans carried with them into the Gauls, when they made the conqueſt thereof. And, 3. The Teutonic, or that dialect of the Teutonic ſpoken by the Franks, when they paſſed the Rhine and eſtabliſhed themſelves in Gaul.

Of theſe three languages, in the ſpace of about thirteen hundred years, was the preſent French formed, ſuch as it is now found. Its progreſs was very ſlow; and both the Italian and Spaniſh were regular languages long before the French.

Paſquier obſerves, it was under Philip de Valois that the French tongue firſt began to be poliſhed; and that, in the regiſter of the chamber of accounts of that time, there is a purity perceived almoſt equal to that of the preſent age.

However, the French was ſtill a very imperfect language till the reign of Franies I. The cuſtom of ſpeaking Latin at the bar, and of writing the public acts and inſtruments of the courts of juſtice in that language, had made them overlook the French, their own language. Beſides, the preceding ages had been remarkable for their ignorance, which was owing, in good meaſure, to the long and calamitous wars in which France had been engaged; whence the French nobleſſe deemed it a kind of merit not to know any thing; and the generals regarded little, whether or not they wrote and talked politely, provided they could but fight well.

But Francis I. who was the reſtorer of learning, and the father of the learned, changed the face of things; and, after his time, Henry Stephens printed his book, "De la Precellence du Langage François."

The change was become very conſpicuous at the end of the ſixteenth century; and under Henry IV. Amyot, Coeffeteau, and Malherbe, contributed towards bringing it to its perfection; which the cardinal de Richelieu completed, by the eſtabliſhment of the French academy; an aſſembly, wherein the moſt diſtinguiſhed perſons of the church, the ſword, and the gown, have been members.

Nor did the long reign of Louis XIV. contribute a little to the improvement of the language: the perſonal qualities of that prince, and his taſte for the polite arts, and that of the princes of the blood, rendered his court the politeſt in Europe. Wit and magnificence ſeemed to vie; and his generals might have diſputed with the Greeks, Romans, &c. the glory of writing well, if they could not that of fighting.

From court, the elegance and purity of the language ſoon ſpread itſelf into the provinces; and now there is ſcarcely any body there who does not write and ſpeak good French. One of the characters of the French language is, to be natural and eaſy. The words are ranged in it much in the ſame order as the ideas in our minds; in which it differs exceedingly from the Greek and Latin, where the inverſion of the natural order of words is reputed a beauty. Indeed the Hebrew ſurpaſſes even the French in this point; but then it comes ſhort of it in copiouſneſs and variety.

It muſt be added, however, that as to the analogy of grammar, and the ſimplicity with which the moods of verbs are formed, the Engliſh has the advantage, not only over the French, but over all the known languages in the world; but then the turns, the expreſſions, and the idioms, of the Engliſh, are ſometimes ſo quaint and extraordinary, that it loſes a good deal of the advantage which its grammatical ſimplicity gives it over the reſt.

The French has but few compound words: wherein it differs widely from the Greek, High Dutch, and Engliſh. This the French authors own a great diſadvantage in their language; the Greek and Dutch deriving a great part of their force and energy from the compoſition of words, and frequently expreſſing that in one ſounding word, which the French cannot expreſs but by a periphraſis. The diminutives in the French are as few as the compounds; the greateſt part of thoſe remaining in uſe having loſt their diminutive ſignification; but what diſtinguiſh the French moſt are its juſtneſs, purity, accuracy, and flexibility.

French is the moſt univerſal and extenſive language in Europe. The policy of ſtates and courts has rendered it neceſſary for the miniſters of princes, and their officers, &c. and the taſte of arts and ſciences has had the ſame effect with regard to the learned.

In Germany, and elſewhere, the princes and perſons of diſtinction value themſelves on underſtanding French; and in ſeveral courts of Europe, French is almoſt as much known as the language of the country; though the court of Vienna is

is an exception from this rule. French is there very little ufed; the emperor Leopold could not bear to hear it fpoken in his court; the Latin and Italian are there cultivated inftead of it. This extenfivenefs of the French language is no modern advantage; William the Conqueror gave laws to England in the French language; and the ancient cuftoms of moft of the provinces of the Netherlands are written in the fame.

Laftly, the French is the fame language every where; not only in all the provinces of France, but in all places where it is fpoken, out of France.

For a critical acquaintance with what regards the French tongue, fee the Remarques of M. Vaugelas; and the obfervations M. Corneille has made on thofe remarks; the Remarques of F. Bouhours; and the doubts of a Basbreton gentleman, by the fame father; the converfations of Arifte and Eugene; the obfervations of M. Menage, and his etymologies, with thofe of M. Huet; F. Buffier's French grammar; and that of the abbé Regnier. Add, the two difcourfes of the abbé de Dangeau; one on the vowels, and the other on the confonants, and many later works.

French, in *Geography*, a confiderable river of America, in the Maffachufetts, which iffues from a fmall pond on the borders of Leicefter and Spencer, in Worcefter county, and which runs through Oxford, and joins Quinebauge river, in Thompfon townfhip, in Connecticut. It derives its name from the French proteftants who obtained a fettlement in the town of Oxford, after the revocation of the edict of Nantes in 1685.

French *Bay*, a bay in the ftraits of Magellan, on the coaft of Patagonia. S. lat. 53° 51′. W. long. 72° 24′.

French *Barley*, in *Agriculture*, a name given to a fort of barley which has the grain naked like wheat, but the ear fhaped in a fimilar manner to that of common barley. It is a kind of barley which is faid to afford a large increafe, and to make good malt and bread. It is fometimes denominated *wheat-barley*.

French *Bean*, a fort of bean moftly grown in the garden; but which may be cultivated in the field where the foil is light and mellow, with great advantage. See Kidney-bean and Phaseolus.

French *Bole*. See Bole.

French *Bread*. See Bread.

French *Broad*, in *Geography*, a navigable river of America, in the Teneffee, which rifes on the S. E. fide of the great Iron and Bald mountains in North Carolina. It is formed by two principal branches, which receive feveral ftreams in their courfe, and unite about 58 miles from the fource of the Nolachucky, the eaftern branch; thence it flows northerly about 25 miles, and joins the Holfton, 11 miles above Knoxville, and is four or 500 yards wide. The navigation of this branch is much impeded by rocks, and fo likewife is the Teneffee branch, which joins the main river 50 miles below this. A large, clear, medicinal fpring, faid to be efficacious in the cure of many difeafes, has been lately difcovered on the waters of this river, about 30 miles in a direct line from its mouth. The water is fo hot that a perfon, upon firft going into it, can fcarcely endure it. Nearer the mouth of the river, a valuable lead mine has been difcovered.

French *Character*, *Coins*, *Companies*. See the fubftantives.

French *Creek*, in *Geography*, a north-weftern water of Alleghany river, into which it falls along the N. fide of Fort Franklin, 80 miles N. by E. of Pittfburgh. This affords the neareft paffage to lake Erie. It is navigable with fmall boats to Le Bœuf, by a very crooked channel; the portage thence to Prefque ifle, from an adjoining peninfula, is 15 miles. This is the ufual route from Quebec to Ohio.—Alfo, a river of Kentucky, which runs into the Ohio, N. lat. 37° 47′. W. long. 86° 40′.

French *Grafs*, in *Agriculture*, a name given by our farmers to a plant raifed for the food of cattle, and more properly called faint-foin. It had its name French grafs, from its coming originally to us from France, and from its ufe in ferving, both frefh and dried, for the food of cattle; the common clover is called grafs alfo by the farmers, though neither this nor the other are properly graffes. Some of our farmers alfo call it everlafting grafs, from its long continuance, a ftrong crop often yielding a plentiful annual produce for forty years without any renewing.

French *Key*, in *Geography*, a fmall ifland in the Spanifh Main, near the Mofquito fhore. N. lat. 11° 12′. W. long. 82° 50′.

French *Keys*, two fmall iflands among the Bahamas, S. of Mayaguana. N. lat. 22° 35′. W. long. 73° 36′.

French *Meafures*, *Money*. See the fubftantives.

French *Mufic*, mufic in the national ftyle of France. The whole French nation feems at prefent pretty generally to have relinquifhed their old ftyle of mufic, for cenfuring which, fifty years ago, Rouffeau was burnt in effigy at the door of the opera houfe at Paris. Lulli is given up; la baffe fondamentale, and the operas of Rameau, which were thought to do fo much honour to the nation, are fading faft, yet they have ftill a few adherents. But the mufical critics in France, particularly the Gluckifts, fo decifively fet up their mufic againft every other, that they feem to expect all Europe not only to bow down to them, but to afk pardon for ever having been pleafed with any other fpecies of mufic than that produced on the model of the operas of Gluck! Thefe gentlemen neither fee nor hear any thing but defects in the fineft compofitions of Italy. The abbé Rouffier is "un enragé" for "la troifieme progreffion," and M. Laborde, for that and the compofitions of Rameau; while the abbé Feytou falls foul on whatever has been faid or done in the theory of mufic, except by himfelf; of the practice, or the merits of compofition or performance, neither he nor the abbé Rouffier feem to care one farthing. It is eafy to difcover in fome articles of the Encycl. Methodique, and other writings, that there are fome lovers of mufic in France, who really feel the elegance, grace, and expreffion of Italian vocal mufic; and who are truly fenfible of the defects and deficiencies of French finging. All nations are ambitious of having operas in their native language. The French, the Germans, the Englifh, the Poles, and the Ruffians have their national theatres; but all the courts in Europe have had ferious operas in the Italian language, compofed and performed by Italians, except the French. The French, the Englifh, and the Germans, are very wife in abolifhing recitative from their mufical dramas. No country, except Italy, has a genuine recitative; but muft the Italians, who have one diftinct from declamation and fong, muft they renounce the original characteriftic of an opera to oblige, or rather to appeafe their neighbours? The French certainly manifeft good fenfe and good tafte in excluding long airs either of bravura or cantabile, till fingers can be found to execute them: but in countries like Italy, where good fingers abound, and in other countries where Italian fingers are tolerated and fupported, are they to prohibit good finging in their theatres to humour French critics? See Opera and Recitative.

French finging at the ferious opera of "Iphigenie en Tauride," has been very aptly compared, not to a female

in

in diſtreſs, but in labour during the throes of childbirth. The French, always partial to "la muſique criarde," have had their taſte flattered by Gluck, who knew that though they could not ſing, they could *ſcream* to ſome tune. His harſh modulations, and their "éclats de voix," augmented, "à force de l'Orcheſtre," he was ſure would be *well heard*, and fix his fame.

French *Nuts*, a term ſometimes provincially employed to ſignify bruſh-wood; and alſo wall-nuts.

French *Order*, *Padſaddle*. See the ſubſtantives.

French *Park*, in *Geography*, a ſmall poſt town or rather village in the county of Roſcommon, Ireland; 83 miles W. by N. from Dublin, and about eight miles from Tulſk.

French *Pox*. See Pox.

French *River*, in *Geography*, a river of Upper Canada, of irregular breadth and form, and crowded with iſlands, ſo that its real banks are ſeldom ſeen. It enters lake Huron from the N. E. in N. lat. 45° 53'.

French *School of Engraving*. The art of engraving, ſo as to deliver impreſſions on paper, was introduced into France from the neighbouring empire of Germany ſome time about the middle of the fifteenth century. The preciſe year of its introduction has not been recorded. The benefits it has ſince conferred, and is ſtill conferring on Europe, are on all hands acknowledged to be great, yet the art appears to have entered France, with all the unobſerved humility of an apoſtle of our holy religion; and that highly cultivated country, to which cultivation the art of engraving has contributed in no trifling degree, to be indebted for its *introduction*, not to the providence of the government, though the government hath ſince done much to accelerate its progreſs, but to the enterprize or neceſſity of ſome individual artiſt, whoſe name has not deſcended to us.

Engraving on wood, or that art which enabled the printer to deliver his work from the ſurface of the engraving, preceded the art of engraving on copper a few years: and both were at firſt employed in France, as in Germany and Italy, in the embelliſhment of books, in which it has been preſumed by Huber and Papillon, that the city of Paris took the lead, though Lyons is ſoon after mentioned.

The moſt ancient French book ornamented with letter-preſs engravings appeared in the year 1482, or ſoon after. It is a tranſlation of "Belial," in one ſmall folio volume, and is ſuppoſed by the French writers to have been printed at Paris, though the name of that city is not mentioned. Yet this book concludes in the following manner, "from which it is not clear whether the tranſlator or printer finiſhed his taſk at the time mentioned."

Here ends the book called "Conſolation for poor Sinners," lately tranſlated into French by the venerable and diſcreet brother Peter Ferget, doctor of theology, and of the order of the Auguſtines. In the year of Grace 1482, and on the 21ſt day of January, he finiſhed this book.

The moſt ancient prints from engravings on copper were alſo the embelliſhments of typographical works. The firſt French book ornamented with copper plates was printed at Lyons in 1488, in folio. This book, the author, or rather tranſlator of which was Nicholas le Huen, a monk of mount Carmel, and profeſſor of theology, is for the moſt part a compilation from the Itinerary of Bernard de Breydenbach, and the title is "A Peregrination beyond Sea in the Holy Land." It concludes with the following words, "Of the peregrinations in Jeruſalem, the environs, and places adjacent. Of mount Sinai, and the glorious Catharine. This work contains the whole deſcription, as far as God would permit it to be known, printed at Lyons by men of ability. Michael Topie of Pyrmont, and James Heremberg of Germany, living at the ſaid Lyon. In the year of our Lord 1488, and on the 28th of November."

In the French work are the views of the ſame cities that are found in the Latin and German editions of the Itinerary of Breydenbach, publiſhed at Mayence in 1486, by Erhard Rewich, with this difference, that the engravings are printed from copper plates in the tranſlation, and with the letter-preſs, and preſumptively from blocks of wood, in the original work. It is not known whether the engraver of theſe plates, (which are of very rude execution,) was a Frenchman or a German. Huber ſpeaks of it as very poſſible that James Herenberg, one of the printers, may have been alſo the engraver of the embelliſhments.

As theſe early works are publiſhed without any engravers' names, (notwithſtanding that in the latter thoſe of the printers are mentioned,) it may ſafely be inferred that thoſe who performed them were little thought of at the time, and that no idea was entertained in France of the future ſuſceptibilities or importance of that art of which theſe were the earlieſt productions. Other anonymous engravings, which have ſince fallen into neglect, were produced before the cloſe of the fifteenth century; but the earlieſt French prints to which the names or monograms of the artiſts appear, are thoſe of Wendel Reich, a foreigner, and preſumptively a German, who was reſident at Lyons in the year 1515, and Jean Duvet, ſometimes called Davet, who was born at Langres in 1510.

Reich engraved on wood, and, according to profeſſor Chriſt, publiſhed many of his works at Lyons, marking them with the cypher which will be found in our plate of the monograms, &c. of the French School of engravers; and, according to the ſame writer, Duvet was known by the name of the Maſter of the Unicorn, from his engravings of the triumphs of that animal. He worked at Paris during the reign of Henry the Second, and publiſhed there ſeveral plates from very Gothic deſigns, and which are engraved in a wretched ſtyle. The principal of them are "Le Dieu Mars," inſcribed I. D. 1530. "Adam and Eve," with the eternal father clothed in a ſacerdotal habit, folio ſize, inſcribed Johannes Duvet fecit. "Moïſe, avec les Patriarchs," folio, and a ſet of twenty-four plates, alſo in folio, of which the ſubjects are taken from the Apocalypſe. Duvet ſometimes placed his initials on a tablet, as appears in our plate of the marks and monograms of French engravers.

Solomon Bernard, frequently termed "le petite Bernard," from the ſmallneſs of his works, appeared ſoon after. He was born in the year 1512; and engraved chiefly for the bookſellers of Lyons, of which city he was a native; though between the years 1550 and 1580, he was alſo employed by thoſe of Tournay and Rouville. The French writers on art ſay, that he became the diſciple of Jean Couſin; however this may have been, his engravings, which are both on copper and on wood, are executed (conſidering the early period at which they were done) in a clear, neat ſtyle, and diſplay in the deſigns conſiderable ſpirit and fertility of invention.

We have thought proper to give more copious liſts of the works of the engravers of the foreign ſchools than of thoſe of the Engliſh, becauſe ſuch liſts are not hitherto printed in any Engliſh book that has come to our knowledge.

The firſt edition of Bernard's bible, which Strutt ſpeaks of as being his moſt eſteemed production, was publiſhed at Lyons in 1550. Subſequent editions, containing impreſſions from the ſame engravings, have been publiſhed, but collectors eſteem the firſt as far more valuable; and it is now become

extremely

extremely rare. In the year 1553 he produced "Les Médailles pour l'Epitome des Antiquités de Jacques Strada. Mantouan, imprimé à Lyon."

Of the other engravings by this master, the first of the French school that is worthy to be so termed, the following are the principal. "Les Metamorphoses d'Ovide," imprimé à Lyon en 1557. The prints to "L'ane d'or d'Apulée," imprimé à Lyon en 1558. "The Historical Vignettes to a French Translation of Virgil's Æneid," imprimé à Lyon 1560. "Un Livre de Thermes au nombre de dix-huit," imprimé à Lyon en 1572. "The History of Psyche in thirty-two figures," 12mo. Twenty-two prints of decorations of theatres, &c. Six small emblematical subjects in ovals. Two hunting pieces. "A View of the City of Lyons;" (probably the first French landscape that was ever engraven.) "A triumphal Chariot with Arms." "A Head, with a triple Face surrounded by Cherubims;" and the ornaments (in ovals) to a book of hymns, printed also at Lyons.

Stephanus de Laulne was born at Orleans in the year 1520, and travelled twice to Strasbourg, probably for improvement in his art. At what time he died is not mentioned, but he was at Strasbourg, for the second time, in 1590, when he must have been in the seventieth year of his age. He made some successful copies from the engravings of Mark Antonio, which were now in high and deserved repute; but the far greater part of his prints are from his own designs, and being in general small, he is classed by collectors among "the little masters."

De Laulne was a man of considerable inventive powers, but though his compositions abound with figures which are not ill designed, his drawing is frequently defective, particularly in the long and slender proportions of his figures, which meagreness he probably imbibed from studying too much the productions of the early German engravers. He worked entirely with the graver, and his chiaro-scuro is yet more defective than his drawing.

The abbé Marolles mentions three hundred and eighteen engravings by this master, of which the following will probably be found the best. He sometimes placed his initials to his works, and at other times only Stephanus fecit. "David beheading Goliah," "The Massacre of the Innocents," "The Martyrdom of St. Felicité," "The Rape of Helena," "Alexander commanding the Books of Homer to be shut up in the Chest of Darius." The above are all copied from Mark Antonio. "The Serpent of Aaron," painted for the Cordeliers of Sens, after Jean Coussin. This is in folio, and is probably the largest print from the hand of this master. "The Rape of Hippodamia," after Rosso. The following are engraved from his own designs. A set of thirty small subjects from the history of the Old Testament. A set of four plates of heathen gods, *viz.* Jupiter, Neptune, Mercury, and Ceres, in circles. A set of six plates, of statues of gods and goddesses. A set of eighteen mythological subjects, ovals. A set of twelve, the months of the year circles. A set of the four monarchies, in ovals. A set of four from ancient history, in ovals. A set of four rural occupations, in ovals. The three Graces, inscribed Sic Rome Carites niveo ex Marmore sculp.

Contemporary with de Laulne, but inferior in merit, was Noel Garnier, to whom has been falsely attributed the credit of introducing the art of engraving on copper into France. The French writers on the fine arts say, that he was born some time about the year 1520, and that presumptively, judging from his name; he was by birth a Frenchman. His real merit is so trifling that this matters but little. He was by education probably a goldsmith, and from the Gotho-german style of his engravings, it may reasonably be conjectured that he learned, what he knew of the art, under some German goldsmith and engraver. After stating, that "his works are very rude and badly executed," Strutt mentions a small plate of a combat between naked men, of whom there are several, in which he seems to have made a feeble attempt at copying the style of Sebald Beham. The only other engravings that are known to be from the hand of Noel Garnier, are forty-eight plates representing the arts and trades, and an alphabet of capital letters ornamented with figures and foliage. His singular mark will be found in our plate of monograms, &c. of the French school.

Pierre Voeiriot, or Woeiriot, engraved both on copper and on wood, and was also a goldsmith. He was born at Bar-le-duc, in Lorraine, in the year 1525, but established himself as a goldsmith and engraver at Lyons. His prints, of which there are as many from wood as from copper, are chiefly after his own designs, and are tolerably well executed, considering the general state of French art at the time.

There is still extant a curious book adorned with engravings on copper by this artist, entitled "Pinax Iconicus Antiquorum ac Variorum in Sepulturis Rituum," to which is prefixed his own portrait, and which was printed at Lyons in the year 1556. He occasionally used two monograms, which are somewhat complicated, and intended to signify Pierre Woeiriot of Bar-le-duc; and Papillon adds, that he marked his engravings on wood with the sort of double cross, which will be found in our plate of the monograms and marks used by the ancient engravers, and which is called "la petite Croix de Lorrain."

Strutt places the birth of this artist in 1510, but does not cite his authority. His principal engravings are as follow. "The Sacrifice of Abraham," in folio. "Moses saved from the Waters," in folio. "Phalaris shut up in the brazen Bull," a small upright. "A Woman with two Children in her Arms casting herself on a funeral Pile." Two small landscapes, in which are introduced a great number of figures. In one is represented a funeral oration, in the other two naked men are fighting on the summit of a funeral pile. The three latter probably belong to the book which is mentioned above of sepulchral rites. "The Battle of Constantine with Maxentius," after Raffaelle, in folio. The above are all engraven on copper. The medallion of Jacques Bornonius, dated in 1573, is probably one of the best of his engravings on wood: it is very delicately cut, its ornamented frame is supported by Mercury and Minerva, and it is inscribed with Greek, Latin, and French verses, terminating with the following couplet:

> "Qui veut pour son pais combattre á tous alarmes
> Doit avoir de Mercure et de Pallas les armes."

Jacques Perisin, otherwise Perisim, otherwise Persinus, was born in France some time about the year 1530. In concert with J. Tortorel, he designed and engraved a set of twenty-four large prints representing the war of the Huguenots, and other remarkable events relative to the history of France between the years 1559 (which was marked by the death of Henry II.) and 1569, when the German troops were dispersed. Some of these are executed on copper, and, according to Strutt, others on wood. He says, "those on copper are slightly *etched*," which, it is worthy of remark, is the first time we met with this word in the history of French engraving, though etching had now been invented near half a century: "the etchings are in a coarse, incorrect style, nor have the impressions from wood much to recommend them with regard to the compositions, but they are

are executed with a tolerable degree of attention; and the crofs ftrokes, or hatchings, are well imitated."

The mark of this artift will be found in our plate of thofe of the French fchool; but he fometimes infcribes his name at length, and fpells it not always alike. It is profeffor Chrift who reads it Perrifin, and perhaps juftly.

René Boivin was born in the province of Anjou in the year 1530, or thereabout. "His plates, in general, are executed with the graver only, in a manner refembling that of Cornelius Cort;" but in fome few inftances he practifed the art of etching. His works, though not held in the higheft eftimation, are by no means devoid of mechanical merit; for he handled the graver with much facility, but his drawing is very defective, particularly in the extremities of his figures.

Boivin fometimes figned his works with his baptifmal name only, as Renatus fecit, but more frequently with a cypher compofed of an R and a B, as feen in our plate.

He engraved the portraits of the philofophers and poets of antiquity in twelve plates 4to.; and feverally thofe of Clement Marot, (dated 1556,) Jean Sebaftian Pfanferus, George Vicellus, theologian, and himfelf; dated alfo in 1556.

His principal hiftorical works are, an emblematical plate reprefenting "The Triumph of Virtue, and the Defeat of Vice," a folio plate. "Sufanna and the Elders," in 4to. The plates for a work entitled "Livre de la Conquefte de la Toifon d'or, par le Prince Jafon de Teffalie." Thefe were defigned by Leonard Thiri, and are enclofed in ornamental borders.

"Hagar and Ifhmael before the Houfe of Abraham," a fpirited etching of a 4to. fize. "Four Bandits pillaging a Peafant's Cart," alfo an etching in 4to. "Françoes premier march fuel au temple de l'Immortalité, et laiffe loin derriere lui l'ignorance, la ftupidité, &c."

Leonard Gaultier, or Galter, as he fometimes defignated himfelf, is prefumed by the French writers on art to have been a native of France; but profeffor Chrift, though without affigning his reafon, fuppofes him to have been born in Germany in the year 1560, or thereabout. He worked entirely with the graver, imitating the ftyles of Crifpin de Pafs and the Wierixes. But while we are furprifed at the great number, precifion, and neatnefs of his works, we cannot but lament the ftiffnefs and incorrectnefs of defign by which they are equally characterized. According to the abbé Marolles, the number of prints engraved by this mafter amount to eight hundred, and they are chiefly from his own defigns, though he fometimes worked after Raffaelle, Rubel, Caron, and Dumouftier. His engraving of the Laft Judgment of Michael Angelo was not done from the original picture, but copied from the plate by Martin Rota. His cypher, or monogram, will be found among thofe of the French fchool. The lift of his principal engravings is as follows:

"The Loves of Cupid and Pfyche," after Raffaelle, in 8vo., not engraved from the original pictures, but through the medium of the prints of Auguftino Veneziano. The "Proceffion of the League," a fatyrical piece, in folio. The "Family of Henry IV." folio. The "Affaffination of Henry IV." folio. The "Coronation of Maria de Médicis," folio; infcribed L. Gaultier, fc. 1610. The "Cyclopes forging Thunder-bolts," folio.; after Jean Coufen, infcribed Léonár Galte fecit, 1581. "A Sacrifice," in the antique ftyle, folio; after Martin Freiment. A fet from the Old and New Teftament, in 4to. A fet of the prophets, apoftles, and evangelifts, in 8vo., and the following portraits: Philippe de Mornay, lord of Pleffis, in folio, 1611. Alexandre Bouchárt, vifcount Bloffeville, folio; after Dumouftier, 1613. Meffire Jacques Amyot, bifhop of Auxerre. Henry III., by the grace of God king of France and Poland; infcribed L. Gaultier fecit. 4to. Stephan. Pafchinus Regiarum Rationum Patronus, 1617. 4to. Petrus Aerodius Quæfitor Andegavus, 1615. 4to. Charles de Gontaut de Biron, marefchal of France, 4to. Henry, duke of Montpenfier, 4to.

Melchior Tavernier began to refide at Paris, where he publifhed his own engravings, fome time about the year 1620. He was originally of Anvers, and is the firft whom we find honoured in France with the title of engraver to the king. Yet nominal honours and real merit are not infeparable. Tavernier's real ftock of talent as an artift was inconfiderable. His productions are chiefly portraits and maps, with fome few ornaments, and other fubjects of minor importance, from his own defigns, and from thofe of Daniel Rabel.

His principal plate is a large upright folio, of which the fubject is an equeftrian ftatue of Henry IV. of France, fuperfcribed "Melchior Taverneir, à Paris, graveur et imprimeur du Roi, pour le tailles douces, demeurant l'ifle du palais, fur le quay de l'efpy d'or, 1627."

Of his fmaller works, a buft of the duke d'Aleçon, crowned with laurel, with four French veres, in 8vo. is among the beft.

Huber has chofen to confider the boaft of Melchior Tavernier, that his father Gabriel firft brought to Paris the art of engraving on metal, as unfounded: but Huber's premifes do not neceffarily lead to this conclufion, and the prefent writer will readily pardon the court of France, if, on account of this merit of his anceftor, Melchior was created engraver to the king; for if the fins of the fathers may religioufly be vifited on the children, furely their virtues may alfo be vifited.

Melchior fays, "there was not till that time (the time that Gabriel Tavernier of Anvers introduced the art of engraving on metal,) any one in the kingdom of France who practifed the art, nor any one who knew its excellence."

Now according to the fame writer, (Huber,) Melchior was born in the year 1560, or thereabout; it therefore only requires that Gabriel fhould have practifed engraving on metal about thirty years before the birth of his fon, (which is furely by no means incredible,) to fubftantiate the fon's ftatement: yet it muft be confeffed that none of Gabriel's engravings have been feen by the prefent writer, nor are any mentioned by Melchior or any other of the French writers on art.

The honours which pofterity have awarded to Jean Baptifte Tavernier ftand on a far lefs queftionable foundation. From contemplating and admiring his father's maps, he imbibed an irrefiftible defire to travel, and by fubfequent travellers his name has been juftly celebrated. See Jean Baptiste Tavernier.

Philippe Thomaffin was born at Troyes, in Champagne, in the year 1536. He went to Rome at an early age, and began engraving, like Hogarth and Sharp of England, by ornamenting with the graver and fcorper the furniture of the table, and buckles and other articles of drefs. He afterward placed himfelf for improvement under Cornelius Cort, and perhaps for a time under Cherubino Alberti. Huber fays he ftudied under the former, (who was now in high repute at Rome,) and Strutt, that "it is very poffible he might actually ftudy under the direction of the latter. He worked with the graver only, in a flight, but clear and firm ftyle. There is, however, a ftiffnefs in his execution, which being rendered more vifible by the total want

want of effect in his prints, gives them a harsh unfinished appearance. His drawing is rather mannered, than absolutely incorrect."

Thomassin died at Rome at an advanced age, where he had the honour (for so it should be esteemed) of instructing Callot in the use of the graver; but a handsome lady whom Thomassin had married, and of whom he was jealous, was the means of preventing Callot from remaining long under his tutorage. His engravings consist of more than two hundred plates, of which the subjects of fifty-two are the Italian antique statues. Of the remainder, the principal are, "Philippe Emanuel de Lorraine, Duc de Mercœur," in folio, dated 1595. "Jesus Christ and the Apostles," after Raffaelle, on fourteen folio plates. "Saint Margueritia, holding a Palm in her Hand, with her Foot on the Wing of a Dragon," from Raffaelle, in folio, 1589. "Saint Cecilia, and four other Saints," from Raffaelle, in folio, 1617. "The School of Athens," after Raffaelle, wherein he has changed the philosophers Plato and Aristotle for St. Peter and St. Paul, large folio. "The Doctors disputing respecting the Holy Sacrament," from the celebrated picture in the Vatican by Raffaelle; a large plate, dated 1617. "Sarasin landing at the port of Ostia," from Raffaelle. "Holy Family," after F. Zucchero, in folio. "The Adoration of the Kings," after F. Zucchero; a large plate, upright in form, and arched at the top. "Miracle of Jesus at Cana," from F. Zucchero, folio. "The Nativity," from Ventura Salembini. "The Purification of the Virgin," from Barroccio. "The Four Martyrs," after B. Passari, in folio. "The Last Judgment," from F. Vanoi, in folio. "Allegory of the Redemption." Here the virgin is seen in the clouds interceding for the patriarchs; from Vasari, folio. "Apollo with the Muses dancing around him," from Balthasar Peruzzi; a large print, in the form of a frieze, engraved on two plates, and dated 1615. The works of this artist are most of them marked with his name at length.

Thomas de Leu was born at Paris some time about the year 1570. He worked entirely with the graver, which he handled with much care. His style is neat and mechanically clear, resembling that of the Wierixes; and his works consist chiefly of portraits of the celebrated characters of his time, of which several are engraved after his own drawings, and the rest from the pictures of Bunel, Caron, Rubel, and Quenel.

Of his historical works, which amount but to very few, we are only able to enumerate an "Ecce Homo," attended by angels bearing the symbols of the passion; "The Twelve Sybils," designed by himself; "The Life of St. Francis," in twenty-five plates; and "Justice rewarding the Labours of the Husbandman," from Frederic Zuccaro. His principal portraits are of the following personages:

Henry de Bourbon, prince of Condé, at the age of nine, dated 1595. Césart Monsieur, aged five years. Henri III. king of France and Poland. Mary Stewart, queen of France and Scotland. Charles de Bourbon, count of Soissons. François de Bourbon, prince de Conty. Anne duke of Joyeuse, admiral de France. François de Bone, lord of Lesdigueres. Charles de Goutant de Biron, mareschal de France. Charles de Gonzague, duke of Nivernois. Charles de Lorraine, duke of Maine. Henri de Savoye, duke of Nemours and of Genevois. Henri de Montmorency, constable of France. Louise de Budos, the spouse of the former. Louise de Lorraine, dowager of France. Louis Serven, advocate-general. Jean Passerat, a learned man and a poet, represented in profile, from having lost an eye. Franciscus Ranchinus, professor medicus. Bonus de Broe, Turnonensis, sacerdos et abbax. 1588. Bust of Henry IV. after Bunel, folio. Bust of Henry III. and Marie de Medicis, after J. Quenel, in folio. Marie de Medicis, princess of Florence, and M. Nicholas de Neufoille; the last of which, in the opinion of Strutt, is a fine specimen of his ability in portrait engraving.

The prints by this artist are commonly inscribed either Thomas, or Th. de Leu fe. et exc.

Louis Businck was born in France toward the close of the sixteenth century, and practised that mode of engraving on wood which had been invented almost a century before by Mair, or by Hugo da Carpi, and was technically termed engraving in *chiaro-scuro*. Three blocks of wood are successively impressed on every print produced in this manner. The first for the outline; the second for the deeper shadows; and the third for the demi-tint. See Wood Engraving.

Businck practised this mode of art with considerable success. He probably learned it in Germany, for we find him, according to Heinnekin, engraving at Minden, about the year 1630, in concert with George L'Allemand.

His style of engraving is broad, bold, masterly, and in all respects superior to that of his coadjutor. Heinnekin adds, that before he quitted Minden for Paris he had executed the following subjects from compositions of his own.

"Fidelity," an allegorical piece, dated 1630, in folio. A Man, half-length, 1630, folio. A Cavalier on foot, 1630. A Peasant with a wallet. Another Peasant carrying a pitcher.

The following, which are also in clare obscure, (or chiaro-scuro,) are from the designs of L'Allemand.

"St. Peter holding the Keys," in 4to. "The Apostles, John and Matthew, in folio. "Judith with the Head of Holofernes," in folio. "Moses sitting with the Tables of the Law," in folio. "A young Man with a Plume in his Hat playing on a Flute," in folio. "Æneas rescuing his Father Anchises and his Family from the burning of Troy," an upright, in folio.

L'Allemand, the coadjutor of Businck, was also a native of France, and, according to abbé Marolles, was born at Nancy. Papillon, from the information of his father, says that he resided at Paris, where he expended such considerable sums in constructing presses and other machinery of his own invention, for printing chiaro-scuro engravings on wood, as much impaired his circumstances. To which Strutt adds, that he made a great number of drawings to be engraved in that manner, many of which he engraved with his own hands; "and when one sees how indifferently they are done, his want of success is not surprizing."

Francois Perrier was born at Macon in Burgundy, in the year 1590, and died at Paris in 1660. He painted and engraved in chiaro-scuro, and also performed some etchings on copper. Under what master he learned the first rudiments of art is not known; but he went to Rome early in life, where, though he subsisted with difficulty, he studied hard. His drawings from the antique statues and basso relievos recommended him to the notice of Giovanno Lanfranco; and under the direction of that admirable artist he pursued his studies with better encouragement, and more success.

After a long stay at Rome, he returned to his native country, and painted at Lyons the little cloister of the Chartreuse; going from thence to Paris, he there engaged himself with Simon Vouet; and his reputation continued to increase.

In the year 1635 Perrier returned to Italy; and it was during his second abode in that country that his best etchings were

were executed, particularly thofe after the antique ftatues and relievos.

The word genius, which is applicable to fo few, has been perhaps too haftily applied to the works of Perrier. Without denying him the merits of facility and fpirit, we have ftill to learn, in what refpect he extended the former boundaries of his art. His etchings are coarfe and incorrect; the heads and extremities of his figures are neglected, and his facility is not the facility of feeling. In his works from the antique, he has left behind the exquifite precifion of thofe great models; and has given us little more than the attitudes and compofitions. But his chiaro-fcuro engravings on wood are entitled to much higher praife, and are more juftly efteemed by connoiffeurs.

Whilft Perrier remained in Italy, he Italianized his name, and the etchings he performed there accordingly bear the fignature of *Paria*. His cypher, compofed of an F and a P, will be found in our plate of thofe of the French fchool, to which he fometimes added the letter B, denoting that he was a native of Burgundy.

Of his numerous engravings, we fhall begin with mentioning the beft of thofe which are after his own pictures and drawings.

"A Holy Family," or the infant Jefus and St. John, in folio. "Flight into Egypt," in folio. The Holy Family are here reprefented as paffing a river. "Chrift with the Virgin in a Swoon at the Foot of the Crofs," in folio. "St. Roch curing the Plague," in folio. "The Body of St. Sebaftiana," in folio; infcribed at length Francifcus Perrier Burgundus, inv. et f. 1633. It is a fort of apotheofis of the faint, in which are reprefented faints and angels with the palm and crown of martyrdom. "Venus with the Loves and the Graces," in folio; this is infcribed Fr. Paria Borgog., and is of the proportions of a frieze. "Time clipping the Wings of Love," in folio. This is engraved in chiaro-fcuro, and is a performance of great merit; certainly one of the very beft works of the mafter. It is accompanied by the following Latin motto:

"Omnia vincit amor, vincit mox tempus amorem."

Of the plates which he has engraven from the antique fculpture, and compofitions of Italian and French painters, the following will probably be efteemed among the beft. A fet of the antique ftatues confifting of an hundred plates, in folio. Another fet confifting of fifty plates of the bas reliefs of Italy, in folio. The Angles of the Farnefe gallery, ten plates. "The Affembly of the Gods, and the Nuptials of Cupid and Pfyche," a pair of the frieze form, after Raphael. "The laft Communion of St. Jerome," a middle-fized upright plate from A. Carracci. "The Nativity of Jefus Chrift," from S. Vouet, folio. Portrait of Simon Vouet, furrounded by an hiftorical border, in folio; dated 1632.

Guillaume Perrier, (the younger,) who died in 1655, was alfo born at Macon, and is fuppofed to have been the younger brother of Francis, from whofe defigns he executed feveral plates, imitating his ftyle of etching, but with no great fuccefs.

Auguftin Garnier, (whom Strutt miftakenly calls by the name of Antoine,) was born at Paris in the year 1592, and was living in the time of the abbé Marolles, but the year of his death is not known. He etched his plates with a broad and bold line, and finifhed them with the graver; there is confequently a certain firmnefs and facility in his ftyle, yet the heads and extremities of his figures are fomewhat heavy, and his outlines hard and incorrect. His principal works are, twelve plates from thofe pictures of Primaticcio, which are in the chapel of the palace de Fleury at Fontainbleau. "A Holy Family," "St. John the Baptift," and "Charity," all in folio, after J. Blanchard. "The fainting St. Sebaftian, relieved by Women," from the fame painter, and alfo in folio.

He moreover engraved fome few plates from Pouffin, M. A. Carravaggio and other mafters, on which his monogram appears, for which fee our plate of the cyphers, &c. of the engravers of the French fchool.

Jean de Courbes was alfo a native of France, and born about the fame time with A. Garnier. He engraved chiefly for the bookfellers. His works are little known or noticed, and do not deferve to be noticed more.

At one period of his life he was in England, and engraved here the portraits of fir Philip Sydney, and the countefs of Pembroke, which are infcribed J. de Courbes fecit.

It is merely on the authority of Huber and Roft, that this artift is here ftated to have vifited England. The prefent writer is inclined to doubt the fact, and rather on account of the poetry which is engraved beneath thefe portraits, being in the French language.

The verfes under that of fir Philip are as follow:

"Sidney, dont voicy le vifage,
Scent joindre égalemcnt les armes et les arts,
Et mit tous les deux en ufage,
Sur le mont d'Apollon, et dans le champ de Mars."

and are fcarcely lefs complimentary under the portrait of the countefs:

"Pallas puruft jadis en Grecc,
Comme la beauté que tu vois,
Que feule euft de cette Dieffe
L'efprit, le vifage, et la voix."

Claude Vignon practifed both painting and etching. He was born at Tours in the year 1590, and died in 1670. He ftudied a long time in Italy, imitating at firft the ftyle of Michel Angelo Carravaggio, and with fome fuccefs; but he afterwards fell into a manner of his own, more expeditious, but rough and unfinifhed.

Of his etchings, which difplay the hand and mind of a mafter, the abbé Marolles poffeffed two hundred and feventeen, of which the following may be numbered among the beft.

A fet of thirteen from the life of Chrift, in fmall quarto. "St. John in the Defert." "St. Philip baptizing the Eunuch of Queen Candace." "The Martyrdom of St. Andrew." "The Affumption and Coronation of the Virgin," infcribed Cl. Vignon inv. et fecit, Romæ.

Jaques Callot was born at Nancy, whilft Lorraine was yet an independent dukedom. He is by fome authors reckoned among the engravers of the French fchool, but as he ftudied at Rome and at Florence, and exercifed his art chiefly at the latter city, his biography and works will be found in our account of the Italian fchool of engravers.

Claude Audran is the patriarch of that family who created an era in engraving, and is therefore entitled to refpectful notice in our account of the French fchool. He was the fon of Louis Audran, an officer belonging to the Wolfgang hunters, in the reign of Henry IV. and was born at Paris A.D. 1692. He did not take up the graver till rather late in life, and produced but few prints, but he was the father of Germain and Gerard Audran. From Paris he retired to Lyons, and died there in the year 1677.

Carl or Karl Audran was alfo the fon of Louis, and was born in Paris, A.D. 1594. He difcovered fome tafte for engraving, and learned the ufe of his tools in his native country,

country, but afterward travelled to Rome for improvement, when he produced ſeveral prints that obtained him deſerved reputation, and at his return adopted that ſpecies of engraving which is performed with the graver only, imitating the ſtyle of Cornelius Bloemart.

But though he imitated Bloemart, he aimed at ſuperior neatneſs, and perhaps the prints of Lucas Kilian, and thoſe of the Sadelers, may have been the real foundation of his ſtyle.

On his return from Italy he ſettled at Paris, where he died in the year 1674, without having ever been married. He at firſt was accuſtomed to mark his prints with the letter C. but his brother Claude producing ſome engravings of inferior merit, marked with the initial letter only of his baptiſmal name, he ever after made uſe of the letter K, and wrote his name Karle.

The abbé Marolles, who ſpeaks of this artiſt with great praiſe, attributes an hundred and thirty prints to him. The following will probably be found to include the beſt of his works.

The portrait of Henry de Bourbon attended by the cardinal virtues, an oval, in folio, marked K. Audran ſc. The portrait of André Laurent, phyſician to Henry IV., ſmall oval. The portrait of Pierre Légier, with ornaments, ſmall folio. An allegorical ſubject, including the portraits of Nicolai de Neufville, marquis of Villeroy, and Charles de Neufville. A genius is repreſented as painting a third portrait, and on the palette is written "Unus ex duobus." Marked C. Audran fecit.

Hiſtorical and Emblematical Subjects.—A frontiſpiece to the gallery of illuſtrious women, conſiſting of twenty plates of celebrated women, after Pietro da Cortona. The work is in folio, and with each portrait is a repreſentation of that event in the life of the original, on which her celebrity is principally founded. "The Annunciation," a folio plate, engraved from the picture of Louis Carracci in the cathedral at Bologna, but falſely attributed, upon the plate itſelf, to Annibal. Strutt, who ſpeaks of it as being one of the beſt works of this engraver, has fallen into this error. The "Baptiſm of our Lord," a ſmall oval, after Annibal Carracci, without the names of the artiſts. "St. Francois de Paulo, in folio, after Melini, marked Carl Audran ſc. "The Stoning of St. Stephen," in folio, after Palme be Jene. "The Miraculous Conception," inſcribed "Amat hanc ſapientia matrem," after Jac Stella, in folio. "La Nativité de notre Seigneur," in folio, after the ſame maſter. King David is here introduced recording ſomething on a tablet. "St. Catherine devant la Sainte Famille," in folio, after the ſame, a beautiful piece, in which ſeveral angels are introduced. "The Holy Family," in folio, after Titian, an excellent work. It may be diſtinguiſhed from the numerous compoſitions on this inexhauſtible ſubject, by the following circumſtances. The Virgin Mary is receiving an apple from the infant St. John, St. Catherine is kneeling, and the back ground is a landſcape with ſhepherds and cattle. "La Vierge tenant l'enfant Jeſus," who is tramping on the ſerpent, in folio, after Giov. Lod. Valeſio, marked K. A. F. "Sujet de Theſe," in folio, after Cl. Vignon. This engraving repreſents religion as the true ſcience, and has a Latin inſcription. "St. Francois," in folio, after S. Vouet. The ſaint is repreſented as in an holy extacy before the ſacrament, and the print is inſcribed, Tergeminus in terris vincis. A Frontiſpiece to the book of Joannes Franciſci Niecronis Pariſini. "Ord. Minor. Thaumaturgus," in folio, after the ſame maſter. The ſubject is a genius holding the portrait of Cardinal Mazarin. "L'Aſſomption de la Vierge," in folio, after Dominichino. It is in a circle or a ſhort oval, is inſcribed Reginæ Triumphanti, and eſteemed one of the beſt engravings of Carl Audran.

Michel Laſne was born at Caen in the year 1596, but reſided chiefly at Paris, where he died in 1667. He worked entirely with the graver, and handled that inſtrument in a bold, open ſtyle, ſomewhat reſembling that of Bloemart, though Mr. Strutt believes that he choſe Villamena for his model. His execution is dry, and his drawing, eſpecially of the extremities, ſomewhat heavy. Laſne was induſtrious in his profeſſion, and, according to the abbé Marolles, the number of his engravings amount to about ſix hundred. He ſometimes marked his prints with his name at length, and at others with the cypher, which will be found in our plate of the monograms, &c. of the French ſchool of engraving. The beſt of his works are enumerated below, beginning with thoſe *from his own compoſition.*

"Un Garcon Errant," in quarto. "Compagnie de Payſans en bonne humeur," in quarto. "La Vierge," with the infant Saviour ſleeping under a tree, in folio. "A dead Chriſt mourned by the Magdalen," in folio, dedicated to Lewis XIII. and dated 1641. "Bellerophon monté ſur Pegaſe combat le Cheymere," in folio.

Hiſtorical, after various Maſters —"Sainte Famille," after Rubens, in folio, and very rare. The infant Chriſt is repreſented as careſſing his mother, and St. John introduced by Joſeph, is followed by his lamb. "St. Frances d'Aſſiſe receiving the infant Chriſt from the Virgin Mary," an upright folio, after Rubens. This plate is executed in a much neater manner that his other engravings, but bears the name of De Laſne.

"St. Francis de Paul receiving the Infant Chriſt from the Hands of the Virgin," from the ſame painter. "La Viſitation de St. Elizabeth," in folio, after L. Carracci, but falſely attributed to Annnibal. "La Vierge, et l'Enfant qui dor," in folio, after a celebrated picture of Annibal Carracci. This is in England commonly called "The Silence." It repreſents the infant Saviour ſleeping, and the Virgin holding up her finger as St. John approaches, and has been ſubſequently engraved by Picart, by Hainzelman, and by Bartolozzi. "Ecce Homo," in folio, after Titian. "Jeſus Chriſt dans ſa Gloire," in folio, after Paul Veroneſe. The Saviour is here accompanied by St. Peter and St. Paul. "The Virgin ſeated on a Creſcent," an oval, in folio, after Albani.

Laſne alſo engraved the following portraits, chiefly after his own drawings

Michel Aſénus, Sculptor Regius, in folio. Louis XIII. on horſeback, proclaimed by Fame, and Bernard, duc de la Valette, alſo on horſeback, its companion. In the back-ground of the former is repreſented the battle of Veillance, and in that of the latter the town of Metz: both of which back-grounds are engraved by Callot. Anne of Auſtria, queen of France, a whole length figure, in royal robes, folio. Arnaud, cardinal duc de Richelieu; folio. Julius cardinal of Mazarin, folio. Charles father of Crequi, marſhal of France, folio. Francis de Baſſompierre, marſhal of France, folio. Pierre Seguier, chancellor of France, folio. Nicholas de Bailleur, preſident of the French parliament, folio. Francis Fernandez, a friar of the order of St. Francis. Le pere Joſeph de Paris, a famous capuchin, folio. Louis Petit, General of the order of Trinity, folio. Jean Francois Mieron, a monk and celebrated mathematician; in folio, very rare. Julio Strozzi, the Venetian poet, in quarto, after Simon Vouet, dated 1627. Jean Charles Doria, quarto. Francois Queſtrel, firſt painter to Henry III., from a picture by himſelf; quarto. Le pere Nicholas Couſſin, folio, 1651.

Nicholas

Nicholas Chaperon was born at Chateaudun about the year 1596; he was educated a painter, and ftudied under Simon Vouet, but afterwards preferred etching, of which his works chiefly confift. Travelling to Rome for improvement, he was induced to remain there a confiderable time, during which he produced a fet of prints from thofe pictures by Raphael, in the Vatican, which are called his *bible*. They confift of fifty-two plates, which the prefent writer has not feen, but of which Strutt fays, with fome degree of inconfiftency, that they "are chiefly eftimable as being, upon the whole, the beft copies of that noble work; but, however, the fweet fimplicity of ftyle, and correctnefs of drawing, fo manifeft in the works of that celebrated painter, are totally loft in the affected manner of the engraver. The heads are very indifferent in general, and the other extremities very poorly marked."

At his return from Rome, Chaperon eftablifhed himfelf at Paris, where he etched feveral plates in a fpirited ftyle, generally marking them with the initials of his name, and the addition of the letter F for fecit. Among them the following will be found worthy of preference on account of their merits:

The portrait of himfelf at the foot of the buft of Raphael, in folio. This is generally prefixed to the bible mentioned above, and ferves as its title-page or frontifpiece.

Portrait of Henry IV. of France, at the age of forty-two, in a frame of antique fculpture, beneath which the king, wounded by Du Chatel, is reprefented in bas relief. It is in folio, after Freminet, and bears not even the initials of Chaperon, but is known to be from his hand. This is a very rare print.

Another portrait of the fame monarch, at the age of forty-four, beneath which a battle is reprefented in the fame manner as in the above.

"Une Vierge confiderant l'Enfant Jefus en lui prefentant le Sein," in folio, after his own compofition, as is fuppofed by Roft and Huber, though bearing the name of Titian. Yet it is difficult to believe that Chaperon, or any man would have expofed himfelf to the unpleafantnefs of fuch frequent enquiries after the original as muft be the neceffary confequence of a forgery of this nature.

"An Holy Family," in folio, where the virgin mother is fuckling the infant Chrift. "L'Alliance de Bacchus et Venus," in folio; dated 1659. "Bacchus a qui un Homme prefente a boire," folio. "Bacchus accompagne d'un Homme qui porte un Enfant," folio. "Famille de Satyres," a fmall upright folio. This is a bold and fpirited etching, and one of the beft works of the mafter. "Bacchanale," where a child is pouring forth wine for a Bacchante, in folio. Another Bacchanalian fubject, where Silenus is introduced, mounted on a he goat, in folio. Another, where a young Bacchante is mounted on a fhe goat, in folio. Another, where a child is fucking a fhe goat, which a fatyr is holding, dated 1639.

Pierre Brebiette was born at Mantes on the Seine. He was contemporary with Chaperon, and like him eftablifhed himfelf at Paris, after travelling to Italy for profeffional improvement. He executed a confiderable number of flight fpirited etchings, which prove him to have been an artift of fertile and active fancy. In compofition he is agreeable and profufe; and his figures are well grouped, though not correctly drawn. Moft of his prints are from his own pictures and defigns, though he alfo etched feveral after Raphael and other mafters. He fometimes marked his engravings with his name at length, and at others with his initials enclofed in a heart, and furmounted by a figure refembling the numeral 4, as feen in our plate of the monograms ufed by the French engravers. The fubjects of his principal etchings are:

His own portrait enclofed in a border, fupported by two angels, in quarto; entitled "Peter Brebiette, Calcographus."

That of Francis Quefnel, the painter, fupported by allegorical figures of Painting and Fame.

A fet, or book of various prints, under the title of "Opera diverfa à Pierre Brebriette inventa," in quarto, dated 1658. "The Nativity," in quarto. "The Adoration of the Magi," in quarto. This is an unfinifhed plate, and without the name of the artift. "The Virgin Mary with the Infant Chrift afleep," in quarto, dated 1638.

The Miraculous Conception itfelf feems fcarcely more miraculous than that of the infinitely varied and numerous compofitions to which thefe divine germs have given intellectual birth. When the vaft number of engravings and pictures of the Holy Family and Virgin and Child are contemplated, it really appears as if by fome divine prefcience, the fubject itfelf were inexhauftible, and as if the mental act of comparing their various beauties and merits were deftined to baffle human fufceptibility and judgment. Brebiette has engraven three more plates of the Virgin and Child, in folio; in the firft of which the infant Chrift is crowned; in the fecond, the virgin mother appears on her knees near the Saviour, and attended by two angels; and in the third, faints are adoring her.

"The Converfion of St. Paul," without the name or cypher of Brebiette, in folio. "The Martyrdom of St. Catherine," in quarto. "The Martyrdom of St. Sebaftian," in quarto. "The Death of Niobe's Children," an upright. "Orpheus furrounded by the Brutes," in quarto. An Arcadian fubject with fatyrs, in quarto. "Les Quatrains du Sieur de Pibrac," dated Paris 1640. "The Four Seafons," in fmall ovals.

The following are in the elongated form of friezes.

"The Battle of the Lapithæ and Centaurs," "Thetis at her Toilette;" "A Sacrifice to Ceres." A fet of twelve Bacchanalian fubjects; and a fet of four, reprefenting fea-gods, in folio.

After other painters, Brebiette has engraved the following plates:

"An Holy Family," wherein the infant St. John has his foot upon a cradle, an upright in quarto, after Raphael. Another Holy Family, after Andrea del Sarto, in quarto. "The Martyrdom of St. George," after Paul Veronefe, in quarto. "Paradife," after a grand compofition of old Palma, engraved on two plates, and one of the very beft of the works of Brebiette.

Jacques Stella was born at Lyons in the year 1594, and was the fon of Francis Stella, a native of Flanders, but who had ftudied the arts of portrait and landfcape painting in Italy. He loft his father at the age of nine years, but was already inftructed in the rudiments of drawing. At the age of twenty Jacques went to Italy, and entered the fervice of that diftinguifhed patron of art, Cofmo de Medicis, from whom he enjoyed a penfion equal to that which had been granted to Callot, though far his inferior in merit. After remaining at Florence about feven years, he purfued his journey to Rome, which had been the prime object of his travels, where he fpent eleven years in ftudying Raphael, Pouffin, and the bright exemplars of ancient and modern art which then abounded in that far-famed metropolis.

In the year 1634, he removed to Paris, where Louis XIII., hearing of his merits, affigned him a handfome penfion, and apartments in the Louvre, which induced him to

to abandon a journey he had projected into Spain, and to fettle at Paris, where he was foon after honoured with the order of St. Michael.

In the ftyle of his art Stella is tame, and without energy, though he poffeffes fome portion of grace, and details his forms with confiderable academical knowledge. He was more of a painter than an engraver, and his beft productions are his fmaller pictures of paftorals and children's fports, though thefe are not free from the reproach of languor and inanimation. He generally marked his engravings, which are chiefly performed with the point and aquafortis, with a ftar, a fort of pun upon his own furname, as is exemplified in our plate of the marks, &c. of the engravers of the French fchool.

Stella's etchings, which are not very numerous, are from his own compofitions. The principal of them are, "The Defcent from the Crofs," in folio, and "The Ceremony of doing Homage to the Grand Duke of Tufcany, on St. John's day," a large plate, dedicated to the emperor Ferdinand II., and dated in the year 1621.

This artift died at Paris in the fifty-firft year of his age, and his death is fuppofed to have been haftened by too clofe application to his ftudies.

Etienne, or Stefan Baudet, was born at Blois, A.D. 1598, and died at Paris in the year 1691. He acquired the rudiments of engraving at Paris, but afterwards, as was the cuftom of his age, travelled to Italy for improvement. He varied the ftyle of his engravings at different periods of his life; and connoiffeurs eafily diftinguifh between thofe prints which he engraved before, and thofe which were produced after, his return from Italy. His earlier works were executed entirely with the graver, and though fufficiently neat, are cold, mechanical; and as a French author fays, "the manner accufes the metal." In his fubfequent ftyle, he mingled etching with the work of the graver, and rofe decidedly fuperior to his former felf. From a certain degree of refemblance being traceable between this fecond ftyle and that of Jean Baptifte de Poilly, fome of his biographers have inferred that he imitated that celebrated engraver, without reflecting that Jean Baptifte could have been but a youth when Baudet produced the engravings in queftion.

This artift alfo occafionally engraved in the tafte of Claude Mellan, who was his contemporary; and in the courfe of a long life he produced a confiderable number of plates, from which the following are felected as the moft favourable fpecimens of his abilities. In his firft ftyle, according to Mr. Strutt, (who however appears to be miftaken in fome of his dates refpecting this artift,) are

"The Tribute Money," a middling fized plate, nearly fquare, from Valentino, which (fays this author) I think the moft mafterly of thofe which he executed in this manner. Four large landfcapes lengthways with figures, from Albano, publifhed at Rome in 1672. The figures in thefe are from the hiftory of Venus and Adonis. "The Four Elements," large circular prints, from the fame mafter, dated 1675, (though according to Strutt they are not dated till twenty years after); and "The Martyrdom of St. Stephen," a large folio plate from Annibal Caracci's celebrated picture in the cabinet of the king of France; publifhed in 1677.

In his fecond ftyle, according to the fame writer, are, "Mofes trampling on the Crown of Pharaoh," a large folio, from Pouffin's picture in the Louvre. "Mofes ftriking the Rock," and "The Ifraelites worfhipping the Golden Calf," both in folio, and from the fame mafter. "The Holy Family," from Pouffin's original in the gallery of the Louvre, in folio; and "Venus repofing after the Bath," in folio, and from the fame painter, publifhed 1666. The following large hiftorical landfcapes, adorned with figures, are alfo from the Pouffins. A fet of four, dedicated to the prince of Condé, and publifhed in 1684; and another fet of four, dedicated to the king of France.

From the defigns of other painters, according to the catalogue of Huber and Roft, Baudet has engraven the following plates, *viz.*

"An Holy Family," from Sebaftian Bourdon, in a circular form, and where angels and the infant St. John are adoring our Saviour. "The Adoration of the Shepherds," after Jac. Blanchart, in folio. "The Defcent from the Crofs," after Annibal Caracci, in folio. "The Communion of the primitive Chriftians," after Charles de la Foffe. A fquare plate after Valentino, entitled "Le dernier de Cefar." A fet of fix grand folio landfcapes, after Sebaftian Bourdon. A fet of fix, five only of which are by Baudet, of the grand ftaircafe at Verfailles, after Le Brun, the originals of which no longer exift; (N.B. the fixth plate, which is of the cieling, is engraved by Ch. Simmonneau;) and "Adam and Eve difmiffed from Paradife," after Dominichino, from a picture in the king of France's cabinet; which engraving is efteemed the chef d'œuvre of Baudet.

Befide hiftory and landfcape, this artift has diftinguifhed himfelf by engraving fome of the ftatues in the royal garden at Verfailles, in which he has imitated the fingle-ftroke ftyle of Mellan; and the following portraits are alfo from his graver, and are all of the folio fize. Pope Clement IX. Charles Perault, comptroller-general of the royal buildings, after Le Brun, dated in 1665, and infcribed "Stef. Baudet fc. Acad. Reg." Louifa duchefs of Portfmouth, as Venus, careffing a dove, after H. Gafcar. Antique buft of a Roman lady of the reign of Adrian, from an original in the Thuilleries, and another antique buft of the emperor Adrian himfelf, alfo from an original in the Thuilleries, dated in 1678, and executed in the ftyle of Mellan.

Simon Guillain was a ftatuary, and occafionally an architect, but who having performed at leaft an hundred etchings, is commonly reckoned among the French fchool of engravers. He was born at Paris A.D. 1599, and died in the fame city, according to the French authorities, in 1679; though, according to Strutt, he died in the year 1658. His father was a fculptor of Cambray, under whom he made confiderable progrefs in art before he travelled to Italy. On his return to Paris, he executed, among other works, the baffo relievos and bronze figures to the memory of Louis XIII. in the angles of the "Pont au Change" at Paris: the figures in the niches of the portal of the Sorbonne, and thofe which ornament the Maitre Autel des Minimes de la Place Royal, are alfo from his chifel.

The following flight, but mafterly etchings, are not lefs creditable than his fculpture, to the general ftock of his talents as an artift.

A fet of twenty plates from the life of St. Diego, from the originals of Annibal Caracci and Albano, in the church of the Spaniards at Rome; and a fet of eighty fmall uprights, entitled the Cries of Bologna, alfo after Annibal Caracci, with his life and portrait appended.

Charles David was born fome time about the commencement of the feventeenth century. He was a native of Paris, but under what mafter he ftudied engraving his biographers have not mentioned. Strutt fays of him, with much truth, that "his ftyle of mechanical execution feems to have been founded on an examination of the works of feveral artifts, rather than a direct imitation of any one. He worked entirely

with the graver, in a clear, neat manner, but with great freedom of hand; he often rendered the effect of his prints less pleasing than it otherwise would have been, by crossing his second strokes too squarely upon the first. He certainly drew the human figure with a considerable degree of correctness; but he was apt to overcharge his forms, and mark the outlines of his muscles too powerfully. His extremities especially are, in general, rather heavy and defective. His lights, a fault usual with the engravers of that age, are too much scattered, and too equally powerful: yet his best prints are deservedly held in great estimation. He engraved "The Labours of Hercules," a set of twelve small folio plates from F. Floris. "The Cries of Rome," a set of sixteen small upright folios, copied so faithfully from Villamena, that it is not easy to know the difference apart from the originals. "The Virgin and Child surrounded by Angels," an upright 4to. after Champagne. "La Vierge nourissant St. Bernard de son lait," and another 4to. frontispiece from the same painter. A set of landscapes after Paul and Matthew Brill. An Ecce Homo. "The Gay Nurse and Companion," from his own designs; and a singular print of a man with a snail upon his finger, accompanied by a he goat with a crown of snails upon his head, while a dish full of them is seen on a table, after Callot. This latter is a very rare print.

Jerome David was brother to Charles, and worked in the same style, though with talents somewhat inferior: he went to Italy, and followed there the profession of engraving till toward the middle of the seventeenth century, but the dates of his birth and death have not been recorded.

He usually signed his engravings "H. David." The letter H standing for Hieronymus, which is the Latin for Jerome. The author of the "Series of Engravers," published at Cambridge, not attending to this circumstance, has spoken of his works as if they were executed by two artists, Jerome, and H. David. In some instances, however, his engravings are marked only with his monogram, for which see our plate of cyphers, &c. of the French engravers.

The following list, which begins with his portraits, will be found to include the best engravings from the hand of this artist, the number of whose plates, added to those of his brother Charles, amount to about two hundred and twenty.

Charles I. of England; Henrietta Maria, his queen; Anne, queen of France; Gaston, duke of Orleans; and Cardinal Richelieu; are all whole length equestrian portraits, in folio, and the last a very rare print.

A set of forty-two plates representing the churches, tombs, and altars of Rome: these are etchings, and are after the drawings of Jean Baptiste Montano, a celebrated chaser of Milan, who died in 1621, and whose portrait (in folio) Jerome also engraved.

A set of thirty-six heads of ancient philosophers, from designs of his own, engraved in a coarse, dark style, in 4to. "A Landscape, with Adam tilling the Earth after his Expulsion from Paradise." "An Ecce Homo," a small upright folio, from Guercino. "The Virgin of the Rosary," a small upright folio, after Guido, dated 1633. "The Virgin and Child," a small circle, after Guido. "The Assumption of the Virgin," after Camillio Procaccini. "St. Francis de Paul walking on the Sea," an etching after Robert Picou.

Contemporary with the Davids was Jean Ganieres, an engraver of very slender abilities, who was a native of France, and resided at Paris. His best works are portraits, and the best of his portraits are those of Louis XIII. of France, a small oval, surrounded with ornaments, and dated 1640. Cardinal Flavio Chigi, a small upright; and M. de la Messeraye, in 4to. dated 1679. He also engraved "A Boy sleeping, with a Skull lying near him," a small plate, dated 1640. "A Magdalen," in folio, after Jacques Blanchard, besides some other plates from the same painter.

Francis Tortebat, an artist of far superior merit, was born at Paris in the beginning of the seventeenth century, and died in the same city in the year 1690. He was the son-in-law and pupil of Simon Vouet, from whose pictures and designs he etched several of his plates.

His etchings are somewhat rough, but are performed with great spirit; and he frequently produces a good chiaro-scuro.

In the year 1663 he became a member of the French Royal Academy, and from his etching-needle may be enumerated the following subjects.

The anatomical figures of Jean de Calcar, from the wood engravings which accompany the treatise of Vesalius. An emblematical figure in folio, after Vouet, in which an angel is represented piercing with an arrow a flaming heart, from the same painter, and of the same (folio) size: he has also engraven as follow: "Peace descending on the Earth;" the "Ascent of Elijah;" "Sampson recovering his Strength, and destroying the Philistines;" and "The Apotheosis, or Beatification of St. Louis."

The French writers reckon Jacques Blanchard and Claude Gelee, who both lived at this period, among their school of engravers, though with no very strict propriety, as neither of them contributed to the advancement of that art, and both were very distinguished painters.

Blanchard, as well as Claude, performed a few etchings from his own compositions; of which those which are most deserving of notice are, "An Holy Family," in 4to. published by Huart. Another "Holy Family," published by Cartres. The "Nativity of the Virgin;" and "St. Agnes worshipping the infant Christ," after Caracci.

For an account of Claude see our biography of him as a painter. Yet the curious may not be displeased to be informed that the following etchings are from the needle of this very distinguished artist. They are after his own pictures, and of course are not without merit, though they bear the marks of a hand unpractised in the art of etching. Two folio landscapes with ruins and cattle. Two 4to. landscapes; one a sea-port with mariners; the other a pastoral scene with figures dancing. A set of twenty-eight landscapes, which are highly esteemed among connoisseurs, and the "Via sacra detto Campo Vaccino di Roma," in folio, dated 1636.

Claude Mellan was born at Abbeville, in Picardy, A.D. 1601; of which city his father was receiver of the customs, and paid great attention to the education of young Claude. His genius for drawing discovering itself at a very early period of his life, it was thought proper to send him to Paris, where he became the pupil of Simon Vouet, a painter who was highly celebrated at a time when false criteria of excellence obtained, having had the honour of instructing the king of France, the grand monarque himself! in the arts of design.

Thus says Strutt; but the French writers, with more probability, and indeed with better opportunities of ascertaining facts of this kind, say that from Paris young Mellan was sent to Rome, and *there* attended the lectures of the celebrated Vouet. Now at the time Mellan was sixteen years of age, which is the period at which he is said to have travelled to Italy, Vouet was president of the Roman Academy of St. Luke, and did not return to Paris till the year 1627, when he was summoned home by Louis XIII.

for

for the decoration of his metropolis. After performing, with tolerable fuccefs, a few imitations of the pictures of Vouet, Mellan relinquifhed the art of his preceptor, and dedicated his attention folely to engraving, in which he foon made confiderable proficiency. He worked chiefly from his own defigns, and manifefted great power over the inftruments of his new art.

Of the ftyle of his engraving, as it varied at different periods of his life, we fhall prefently fpeak: that of his defign is marked by a certain affumed brifknefs in fome figures, contrafted by the uneafy languor of others; and his expreffion partakes, in moft inftances, of that fophifticated confidence which properly belongs to the French hiftorical art of the fchool of Vouet.

Moft of the plates which Mellan engraved in Italy, (where he appears to have remained upwards of thirty years, and where, among numerous other works, he produced his prints from the Juftinian gallery, the portrait of pope Urban VIII. and that of the marquis Juftinian,) are executed with the graver alone, and in a manner not materially differing from that in which the graver had been employed by other artifts: that is, with parallel or converging courfes of curved lines, croffed with fecond, and occafionally with third courfes of lines, as the degree of fhade, and texture of the furfaceto be expreffed, might require; but after his return to Paris he invented a new mode of working with fingle ftrokes only; working out his chiaro-fcuro by re-entering his original courfe of lines until they became of the breadth and depth which he deemed neceffary to his effect. Our countryman, Strutt, in commenting on this novel and fingular ftyle, fays, "In fingle figures and fmall fubjects he fucceeded very happily; but in large compofitions, where great depth of fhadow was required, he has failed, and that in proportion as the force of colour (depth of fhade) was wanted. Befides, in fubjects where feveral figures occur, the famenefs of ftyle, which neceffarily appears in every part of the plate, fatigues the eye, prevents objects from relieving each other, and adds greatly to the flatnefs of effect." The truth is, that he has not failed from the caufes which Mr. Strutt has affigned; for it would have been very eafy to have produced much deeper tones than we fee in the engravings of Mellan, by means of fingle courfes of lines, which is proved by their having been fo produced by other artifts; but he has failed in the opinion of the judicious, becaufe this fingle-ftroke ftyle was founded on novelty, and not on principle. The example of Mellan does but go to prove, among many others, that it is one thing to fecure the approbation of pofterity, and another to obtain a little breathing-fpace for the fhort-lived monfters which fafhion has been known to engender upon fine art, in the purlieus of a French palace.

One of the moft celebrated, and I will add, moft juftly celebrated, of the engravings of this artift, is his "Sudarium of Santa Veronica." The reader, if he be not "fkilled in legendary lore," fhould ftop to be informed that Saint Veronica was canonized in confequence of offering our Saviour, as he proceeded to Golgotha, fweating under the burthen of the crofs, her handkerchief or napkin, and that the impreffion of the divine countenance remaining on the drapery, was religioufly preferved, and well it might, as the moft highly and juftly valued relic belonging to the order of St. Face, or St. Veronica.

The engraving of Mellan, accordingly, reprefents the front face of Jefus Chrift, as large as life, and as if depicted or impreffed on drapery. It is an upright folio plate, and is executed entirely by means of a fingle fpiral line, beginning at the extremity of the nofe, which is, as nearly as was practicable, the center of the engraving, and continuing, without intermiffion, over the whole face and back-ground of drapery.

The fuperceffion of the fcience which fhould prefide over fine art, by the unprincipled novelties of fafhion, has been often and juftly regretted. Before an artift prides himfelf on doing what no other man can do, he fhould at leaft be fure that what he attempts is worthy of being accomplifhed. Yet perhaps Mellan did not himfelf fo much miftake means for end, as lead others into this error, from their inadvertently following his example. The fingular ftyle of his art, as exemplified in the Sudarium of St. Veronica, may find juftification, or at leaft excufe, in the opinion of its admirers, from the reflection that a work, fo novel and furprifing, favours of the miraculous, and is fo far analogous to its fubject, and perhaps is, not without fome plaufibility, addreffed to the prejudices, if not to the underftandings, of thofe who have faith in the holy myfteries of the legend of St. Veronica. Moreover the feeblenefs of effect, which Strutt endeavours to account for, is here a merit, or at leaft capable of being fo conftrued; for the impreffion of the holy face thus left on the Sudarium of the Saint, might naturally be expected to be lefs vivid, than if St. Luke himfelf had painted it at his eafel. Something, in thefe cafes, fhould be left for the imagination.

The year of Mellan's return to Paris is not mentioned by his biographers. He married in that metropolis in 1654; and the king being made acquainted, and being pleafed with his talents, beftowed on him a penfion, and affigned him apartments in the Louvre, where he continued to refide till the advanced age of eighty-feven, furrounded with honours and bleffed with an excellent conftitution, which exempted him from the difeafes ufually attendant on this late period of life; he enjoyed a competent fortune, and was greatly efteemed by all who knew him. Florent le Comte fays, that, "Charles the fecond of England was fo much pleafed with his performances that he invited him to refide in London, making him at the fame time very advantageous offers; but the love of his country prevented his accepting them." He does not appear to have had any children; for his plates, at the death of his wife, became the property of his nephew. The fubjects of the principal of them are as follow, beginning with fuch of the allegorical and mythological as were invented by himfelf; "Phœbus paffing the Zodiac," in folio. "Perfeus and Andromeda," 4to. "Venus feated on a Couch with her Doves," 8vo. "Hercules and Atlas," folio. A fea-port whence is feen a rock, on which lies a book where are engraved the papal arms fubfcribed, "Ibi confringes tamentes fluctus tuos," in folio.. "The Refignation of the Regency of France by the Queen-Mother, through the Hands of the Queen of Peace and Mother of God," in folio. "France feated at the Tomb of the Queen-Mother, and holding her Portrait," in folio. "Religion in a fitting Pofture, pointing to a Man, kneeling before her." "St. Stephen diftributing his Wealth to the Poor," in folio. "The Church Militant." In this piece, an angel is reprefented difplaying the crofs to feveral perfons kneeling, in 12mo. A rural piece, in which are introduced a peafant with a winnowing-fan, and a cow licking her calf, in 4to. An allegorical fubject, in which is reprefented a naked female lying on a bed, having behind her a moufe-trap, and before her feveral infantile genii, one of whom raifes her leg, while another prefents her with a bunch of grapes, in folio. This print, which does not difplay much fpirit, is very fcarce, and only half finifhed. A frontifpiece, for a collection of bon mots, reprefenting feveral fatyrs, one of which is feated on a globe,

globe, having this infcription : " fic fe ridendum dat derifo-ribus orbis," 4to.

A political allegory from Antoine Talon, dedicated to cardinal Mazarin. This piece contains a figure reprefenting the adminiftration, lying in an attitude of defolation, and difplaying in the diftance fcenes of horror which devaftate the kingdom. Below, are two Hercules' preparing to bring fuccour, and ftill lower, are two figures writing, beneath which reclines a fleeping Pallas, enchained by two youthful genii, with bands forming the initials of the cardinal's name. This fcarce print is large, and is engraved on three plates.

Another allegory of the fame filly kind, from Guill. de Longueil, dedicated to the fame patron. Here Apollo is reprefented furrounded by the nine Mufes, who are occupied in pourtraying the arms, the initials, and the devices of the cardinal ; and beneath are feen two rivers iffuing from their urns, ornamented with feftoons. This piece occupies two plates ; and, like the former, is extremely fcarce.

The following fubjects are engraved from various mafters. " Judith holding the Head of Holofernes," after Virginia de Vezlo, the wife of Vouet, in 4to. " Salomea carrying the Head of John the Baptift in a Charger," from S. Vouet, in 4to. " A Roman Charity," from the fame, in 4to. " Lucretia," a folio plate publifhed at Rome. " Pfyche and the fleeping Cupid," Rome, in 4to. This piece is engraven with crofs lines, and in a very mafterly ftyle. " The Virgin holding a Rofe, and the Infant Jefus on her knee," from the fame, dated 1633, in 4to. " St. Luke taking the Portrait of the Virgin," from the fame, 1627, 8vo. " St. Francis de Paule contemplating the Heavens," from the fame, Rome, in folio. " St. Catherine on her Knees, receiving from an Angel the Crown of Martyrdom," from the fame, Rome, 8vo. " Genius, Memory, and Will," from Vouet, in folio. " The Eternal, in his Glory," with two figures reprefenting the old and new law. This is the frontifpiece to the Louvre bible, from Pouffin, in folio, without fignature. " Horace crowned by Genius, while one of the Mufes prefents him with the Mafk of Satire," from the fame, in folio. The frontifpiece to the Louvre edition of Horace. " Virgil crowned by Apollo," from the fame, in folio, without a fignature. The frontifpiece to the Louvre edition of Virgil. " The Courtefy of Rebecca, in her firft Interview with Abraham's Steward," a folio engraving from Tintoret, efteemed one of the fineft hiftorical prints of Mellan. " A View of a Palace in a Garden," a folio print after Pietro da Cortona, publifhed at Rome.

His works from the Old and New Teftaments are as follow : " Lot and his Daughters," in 4to. dated Rome 1629. " Sampfon betrayed by Delilah, who is cutting off his Hair," in 4to. The " Burning Bufh and Mofes," in 4to. dated 1663. The " Miraculous Fall of Manna," in 8vo. The " Annunciation," infcribed " Ecce Virgo concipiet," a folio print, dated 1666. " The Madonna," in 8vo. in which the virgin is reprefented feated beneath a tree, with the infant Jefus on her knees. Another of the fame fubject and fize, dated 1659. Here Mary is feated at the bafe of a pillar, and, as in the preceding, fhe holds the infant Jefus on her knees. Another, in which fhe is reprefented feated on a bank, with the infant Saviour ftanding near her, and in the back ground St. Jofeph binding up faggots, while in the four angles are figures from the Old Teftament. " A Holy Family," Rome, 1635, in folio. In this piece the virgin is feated near the ruins of an edifice, with the infant ftanding on her knee. " A Group," confifting of St. Anne, St. Joachim, St. Jofeph, St. John the Evangelift, and St. Bernard. A buft of the infant Chrift. A buft of the Virgin in her youth. A buft of the Virgin, at a more advanced period of life, with her hands croffed over her breaft, 1650, in folio. " Chrift in the Garden of Olives, and his Difciples afleep," in folio. This is a night-piece, and in fome eftimation among connoiffeurs. " Chrift led by the Soldiers," with this infcription, " Pater ignofce illis, quid faciant," in folio. " St. John, and Mary Magdalen, embracing the Crofs," Rome, in folio. " The Crucifixion," dated 1665, in 4to. " Chrift expiring on the Crofs, with the Virgin, St. John, and Mary Magdalen embracing the Foot of the Crofs," in folio. " Jefus Chrift carried to the Sepulchre," during which the graves give up their dead. In one corner is feen written on a tomb, " Terra Mota eft," 1678, in folio. " The Refurrection of Jefus Chrift," infcribed, " Per fe refurgens," 1683, in folio. " The Fathers of the Church affembled in council," 1665, in folio. In this piece is feen a table, with an open book, in which the word " Evangelia" is infcribed.

The number of fubjects which this artift has felected from the rubrics of martyrology, as well as from the reigning whims of the minions of the French court, lead us to fufpect that he followed the tafte of the times in which he lived, and, carelefs or ignorant of the immutability of principle, merely and meanly rendered his art fubfervient to the religion and politics of the hour. Thofe which follow are from his own compofition, as well as feveral of thofe which we have juft paffed. " The Sudarium of St. Veronica," a large folio, of which we have already fpoken. " St. Peter Nolafque," in folio. The faint is borne through the air by two angels. This is the rareft, and one of the beft of Mellan's engravings. " St. Stephen in the Habit of a Deacon," in 4to. The faint is kneeling, and the following infcription mingles with a radiance of light ; " Ecce video Cœlos apertos." " Alexis in his latter Moments," in folio, dated 1649. " St. Bruno in the Defert," an upright folio ; four other folio plates lengthways, from the life of this faint ; in the firft of which he invefts a brother of the order, in the fecond, exhorts the holy brotherhood, in the third, enters the council, and in the fourth fhews the hoft to the military. " St. Ambrofe interdicting the Entrance of the Emperor Theodofius into his Church," a folio plate dated 1681.

" St. Auguftin converted in the Garden of Aleppo," 1660, in folio. " St. Bernard proftrate before a Crucifix," in folio. " St. Cajetan kneeling before a Crucifix," 1664, in folio. " St. Dominic in a Trance," in folio. Befides the principal perfonage in this landfcape, feveral monks are feen in the back ground. " St. Francis in the Defert, kneeling before a Crucifix," 1638, in folio. " St. Francis de Paule," 1627, in quarto. " Pope Gregory writing to King Childebert," 1681, in folio. " St. John meditating in the Defert," 1629, in folio. " St. Ignatius in a Trance," in folio. " St. Jofeph, (Jofeph Chrifti nutritie,)" in folio. " St. Peter at Prayers near a rock, a crucifix in the back ground," in folio. " St. Paul carried up into Heaven," with this infcription : " Sive in corpore nefcio," 1674, in folio. " A Penitent Magdalen lying on a Mat, her Body lacerated by Thorns." " Mary Magdalen expiring, fupported by Angels," Rome, 1687, in folio. " St. Genevieve, a young Shepherdefs, feated in an Attitude of Contemplation, at the Foot of a Tree," 1680, in folio. " St. Claire kneeling before the Body of Chrift," 1667, in folio. " A Nun at Prayers," 1647, in folio. " St. Therefa kneeling in her Cell before a Crucifix," 1661, in folio.

The following portraits are chiefly engraved from the artift's own pictures and drawings.

Claude

Claude Mellan, painter and engraver, 1635, in folio. Pope Urban VIII., from Bernini, 1631, in quarto. Anne of Auftria, queen of France, in weeds, in folio. Louifa-Maria de Gonzague, queen of Poland, 1645, quarto. Cardinal Guido Bentivoglio, in quarto. Charles de Crequies-Lefdiguerey, Marefehal of Franee, Rome, 1633, in quarto. Jean de Saint Bonnet, lord of Toiras, Maréfchal of France, in quarto. Claude Marolles, 1613, in quarto. This is the portrait of a Tourangeau gentleman, and one of the braveft men of his age. Miehel de Marolles, abbé of Villeloin, in quarto. This is the fon of the former, and a great connoiffeur in prints, whom we have fomctimes quoted. Franeis de la Motte le Vayer, 1648, in quarto. Peter Gaffendi, profeffor royal of mathematics at Paris, in quarto. Henry duke of Montmorency, in quarto. Cardinal de Bouillon, 1613, in folio. This is a buft of the cardinal on a pedeftal. The illuftrious Armand, cardinal duke of Riehelieu, in folio. Cardinal Mazarin, gr. folio. Francis Villemonte, bifhop of St. Maloes, 1661, in folio. Pierre Seguier, ehaneellor of France, gr. in folio. This portrait is executed with much fpirit. Nieholas Coëffeteau, bifhop of Marfeilles, Du Mouftier pinx. gr. folio. The celebrated eardinal de Perron, Herbin pinx. gr. folio. Victor le Bouthillier, archbifhop of Tours, 1658. gr. folio. Joann Haberti Eq. T. D. de Montmor, Monument. D.D. Claude Mellan, &c. 1640, gr. folio. Henri-Louis Habert de Montmor, the fon of Jean, 1640, gr. folio. Henrietta Maria de Baude Frontenac, the wife of H. L. Habert de Montmor, 1641, gr. folio. Henri de Mefmes, prefident of the parliament, &c. gr. folio. Pierre Molé, keeper of the feals, gr. folio. Abel Servien, treafurer to the French Academy, gr. folio. Nicholas Claude Fabri de Peirefe, counfellor at Aix in Provence, gr. folio. This is one of the moft beautiful portraits of Mellan.

Befides the works above enumerated, Mellan exeeuted ftatues, antique bufts, and baffo relievos, from the Juftinian gallery, to the amount of 322; as well as the antique ftatues and bufts of the royal palaces of France; but the latter, as has already been mentioned, were performed in concert with Baudet; they form altogether fixty-one pieces.

Miehel Corneille, the father, was born at Orleans in 1633, and died at Paris in 1664. He was a pupil of Simon Vouet, whofe method he invariably followed in the pictures which he painted for different ehurches and palaces. He etched a few plates after Raphael, the Caraeci, and Vouet, of whieh the following are moft worthy of remark.

A Holy Family from Raphael, in quarto. In this piece, whieh has been often engraved, the Virgin is feated by the fide of St. Elizabeth, while the infant Jefus is taken out of the cradle, to be placed on the knees of his mother, and St. John is reprefented bringing fome fruit.

"The Maffacre of the Innoeents," from the tapeftries of the Vatiean, by Raphael, in folio. "Jefus appearing to Mary Magdalen, as a Gardener," or the "noli me tangere," from the fame, in folio. "The Virgin fuckling the Infant Jefus," from L. Caraeei, in folio.

Michel Corneille, the eldeft fon of the former, was born at Paris in 1642, and died in the fame eity in 1708. He was educated by his father, and became one of the moft celebrated members of the Royal Academy. In order to diftinguifh his works from thofe of his father, he fometimes added an A to his baptifmal name, on which account he has received the appellation of Miehel-Ange Corneille, though he is fometimes ealled Corneille of the Gobelins. Having learned the rudiments of art from his father, he went to Italy to complete his ftudies in the fchool of the Caraccii, the ftyle of whofe defign he occafionally imitated with fome fuccefs. He underftood perfpective, and the management of light and fhade, better than the majority of contemporary French artifts; and though he chiefly exeelled in hiftory, was not without a confiderable fhare of merit in landfcape. Strutt fays of his four engravings from the life of the patriarch Abraham, which are after his own defigns, that "they are etched in a fine, bold, free ftyle; the compofitions are full of grandeur; the heads are peculiarly characteriftic; the extremities, like thofe of Raphael, are finely drawn, and the draperies difpofed with great tafte. One may fee how clofely he has ftudied the eelebrated Italian painters, and admire the good ufe he has made of thofe ftudies. The figure of Abraham in the laft, has much of the ftyle of Polidoro Caravaggio in it, and all the naked figures in the third are drawn in the manner of Caracci."

A printfeller of Rome having obtained thefe four plates, and having heard of the fame of Raphael, had the crafty ignorance to infcribe beneath them the name of that great painter, and there were perfons at that time, as at prefent, the ready dupes of deception, and who confulted no other oracles for the truths of art.

The fubjects of thefe four prints, whieh are now become very fearee, are, 1ft. The Deity appearing to Abraham. 2d. Abraham journeying with Lot. 3d. Abraham putting to fight the Army of the Confederate Kings. 4th. Ifaac taking leave of his mother before his departure for the faerifice. The remainder of the principal works of this artift are as follow:

"Delilah cutting off Sampfon's Hair." "The miraculous Coneeption." In this pieee St. Ann and St. Joachim are reprefented in attitudes of admiration, and above is feen the Holy Ghoft. "The Annunciation," occupying two plates. The angel is engraved on one, and the Virgin Mary on the other. Another "Annunciation" on a fingle plate. "The Nativity, with the Shepherds worfhipping Chrift." The infant Jefus is lying in the manger amid oxen and affes. "The Flight," from a picture in the White Penitents, at Lyons, in whieh St. Mary is reprefented as about to enter a boat. "The ealling of Peter and Andrew," a picture in Notre Dame, at Paris. "The Virgin embraeing the Infant Jefus, worfhipped by St. John the Baptift," from a painting in the Feuillans, at Paris. "St. John the Baptift in the Defert." "Jefus Chrift, the Way, the Truth, and the Life." "St. Andrew adoring the Crofs," finifhed by Jean Mariette. This is a beautiful fmall upright, from a defign by Corneille himfelf. "Jefus Chrift and the Virgin appearing to St. Franeis," from a painting in the Capuehins, at Paris. "St. Francis of Affife," at full length. "St. Francis liftening to celeftial Mufie." "St. Anthony of Padua earrying the Infant Jefus in his Arms." "The Apotheofis of Æneas." "Hercules fupporting the Globe of France." "The Genius of Painting." This is a frontifpiece to M. de Piles' Lectures on Painting. "The Inhabitants of Madagafear fwearing Fealty to the King of France." "The betrothing of St. Catherine," from a defign of L. Caracei, in folio. "The Virgin," from Caracei, in folio. This is a landfcape in whieh the Virgin is reprefented fitting at the foot of a rock, with the infant Jefus. "A Landfeape," in which Jacob is feen ftruggling with the Angel, after Ann. Caraeci. "St. John the Baptift preaching in the Defert," from the fame. "St. John the Baptift interrogated by Two Difeiplies," a landfeape from the fame. "St. Francis difgraced," a landfcape from the fame. "Mercury prefenting the Lyre to Apollo," a landfcape from the fame. "Silenus, a Satyr, and a Faun," a landfcape from the fame. "Pan feated with Apollo," a land-

landſcape from the ſame. "An indigent Family, followed by a lame Beggar on Crutches," from the ſame. "Hagar baniſhed by Abraham," after P. da Cortona, falſely aſcribed to Ann. Caracci, in folio.

Beſides the above, he etched from the works of his father, "The Sacrifice of Abraham," "King Phineas delivered from Harpies," and "Cleopatra taking the Aſp from the Baſket of Fruit."

Jean Baptiſte Corneille was born at Paris in the year 1646, and died in the ſame city in 1695. Strutt has dated his birth ten years earlier, and has ſpoken of him as the elder brother of Michael, when he was really the younger. Without uniformly evincing the ſame excellence as his brother, he is ranked among the celebrated artiſts of the French ſchool. After reſiding ſome time at Rome, he returned to Paris, and was ſoon after nominated a profeſſor of the French academy. He painted, at Notre Dame, "St. Peter delivered from Priſon;" and for the church of the Carmelites, "The Appearance of our Saviour to St. Thereſa and St. John, after his Crucifixion."

Like his brother, he etched ſeveral pieces of his own compoſition, as well as from thoſe of the Caracci.

It is to Jean Baptiſte Corneille that we owe the publication of the fineſt ſtatues of Florence and Rome, reduced from actual meaſurement, of which himſelf engraved the greater number; the others were executed by F. Mariette, and C. Simoneau.

Among the pieces engraven by himſelf, may be mentioned "The Buſt of Michael Angelo." "Suſanna ſurpriſed in the Bath." "St. Auguſtin, ſeated in a Garden, in the Midſt of his Diſciples." "A half length Figure of St. Bernard." "Jeſus Chriſt appearing to St. Thereſa and St. John, after the Crucifixion," from his own painting in the Carmelite church at Paris. "The Buſt of Monſieur, crowned by Victory, with the Trophies taken at the Battle of Caſſel." "A Medallion of Apollo contemning Love." "A Medallion of Daphne transformed into a Laurel." "Virtue preparing her Crowns," an octagon. "An oval Medallion of Apollo playing at Quoits with Hyacinthus." "The Moon mounted on her Chariot drawn by Stags," finiſhed by J. Mariette. "Mercury in an Orb," finiſhed by the ſame. "Diana diſcovering the Intrigues of Caliſto." A collection of fifty plates of deſigns for the uſe of architects. The plates for the elements of painting, by M. de Piles. "St. John the Baptiſt in the Deſert," a landſcape from Annibal Caracci. "The Samaritans," a landſcape from the ſame. "St. Francis branded with Diſgrace," from the ſame.

Several artiſts have engraven from the originals of Jean Baptiſte. J. Mariette alone has himſelf engraven and cauſed to be executed fifty-five of his pieces.

Henry Mauperche was born at Paris A. D. 1606, and died in the ſame city in 1686. We are not informed whether he ever viſited Italy, though this ſeems highly probable, for his ſtyle of painting and engraving greatly reſembles that of Herman Swanevelt; after whom he has engraven ſeveral landſcapes.

He became a member of the royal academy, and though a landſcape painter, was nominated profeſſor in 1655. Fourteen hiſtorical landſcapes were painted by him on the walls of one of the royal apartments at Fontainebleau. He has alſo engraven ſeveral landſcapes, the greateſt number of which are of his own compoſition, of which the following claim reſpectful attention. A ſeries of ſix plates from the ſtory of Tobias, in folio. A ſeries of ſix plates illuſtrative of the life of the Virgin Mary, from the Annunciation to the flight into Egypt, in folio. A ſeries of twelve landſcapes from Swanevelt, in 4to. Two ſubjects from the Bible; 1ſt. "The Prodigal Son ruined by Courteſans." 2d. "The Prodigal Son received by his Father," inſcribed "H. Mauperchè inv. pinx. et fec." in folio. Two landſcapes, with ruins and figures, id. fec. in folio. Two mountainous landſcapes, with buildings and figures, id. fec. in folio. A landſcape from the fable of Marſyas, id. fec. in folio.

Laurent de la Hire was born at Paris in 1606, and died in the ſame city in 1666. His father Stephen de la Hire, who had long exerciſed the profeſſion of a painter in Poland, obſerving the promiſing talents of his ſon, inſtructed him in the principles of his art. Young de la Hire afterwards ſtudied in the ſchool of Vouet, and was the firſt pupil of that maſter who ſtruck out for himſelf a new path. Notwithſtanding ſome imperfections, his paintings acquired him great reputation, and he was received into the academy in 1648.

But it is rather as an engraver, than as a painter, that we ought to regard de la Hire. He has engraven, in a light and elegant ſtyle, ſeveral pieces after his own compoſition. "A Holy Family, in which St. John is ſeen kiſſing the Feet of the Infant Jeſus." This piece is inſcribed L. de la Hire inv. et ſc. in folio. Another "Holy Family." This is a very fine landſcape, into which a great number of angels are introduced, id. fec. folio. "A landſcape." In this piece the Virgin Mary is ſeated on the ground, behind her St. Joſeph, and before her the Infant Jeſus, who bruiſes a ſerpent with a croſs brought by angels, id. fec. 1639 in folio, "A Repoſe during the Flight to Egypt;" a beautiful landſcape in folio, id. fec. "Chriſt with the Holy Women, and St. John, at the Foot of the Croſs;" inſcribed L. de la Hire, 1639. aq. fort. in folio. "The Converſion of St. Paul," id. fec. in folio. This piece is deſervedly admired. "The Judgment of Paris," in a beautiful landſcape, id. fee. in folio.

Iſrael Henriet was born at Nancy in the year 1607, and died at Paris in 1661. He was the ſon of Claude Henriet, a painter from Châlons, who had ſettled at Nancy. He went to Rome with the view of improving himſelf in the art of painting, under the direction of Antoine Tempeſta; but it ſhould ſeem that his progreſs was not conſiderable. On his return to his native country he ſettled as a printſeller at Paris, and Callot, de la Bella, and eſpecially Iſrael Silveſtre, his nephew and pupil, were employed by him. His ſtyle of engraving is ſimilar to that of Callot, with whom he was connected in the ſtricteſt bonds of friendſhip. At his death, Silveſtre inherited all his plates, which were extremely numerous. Iſrael Henriet has left behind him a vaſt variety of views and ſmall pieces from his own hand.

Remi Vuibert, or Wiburt, who was educated by Vouet, is ſuppoſed to have been a native of Paris, and to have been born about 1607. He reſided chiefly at Rome, where he executed ſeveral etchings from Raphael, Guido, Dominichino, and other Italian maſters, as well as from his own deſigns, among which the following are moſt remarkable. "The Cure of one poſſeſſed by the Devil," from a deſign of his own, dated 1639, in folio, nearly ſquare. A ſeries of arabeſque and groteſque figures, painted by Raphael for the Vatican, 13 pieces in folio; the ſame figures which were ſubſequently engraven by G. Audran. "Adam and Eve eating the forbidden Fruit," from a picture in the Vatican, by Raphael, 1635, 4to. "The Deciſion of Solomon," from the ſame, 1635, ſmall folio. "Marſyas conquered by Apollo," from the ſame, in 4to. "Providence governing the World," from the ſame, 4to. "The Deſcent from the Croſs," after Pouſſin, in folio; this piece has likewiſe been engraven by Stephen Gantrel.

Nicolas Mignard was born at Troyes, in Champagne, in the year 1608, and died at Paris in 1668. He acquired the udiments of art under Jean Boueher, of Bourges, and carefully ftudied the antique ftatues and pictures of Primatiecio and of M. Roux, preferved in the palace of Fontainebleau. He afterwards took a journey to Italy, and, on his way thither, ftopped at Avignon, where he became a hufband. During the period he remained with his father-in-law, he received the appellation of Mignard of Avignon. From this city, he departed for Rome, in order to improve himfelf in art. He painted feveral hiftorical fubjects for the palaee of the Thuilleries; fome portraits, by whieh he acquired great reputation; and he engraved the following eight plates from the pictures of Annibal and Agoftino Caracci in one of the apartments of the Farnefe palace. 1ft. "The Choice of Hercules." 2d. "Hercules repofing after his Labours." 3d. "Hercules fupporting the Globe." 4th. "Ulyffes braving the Song of the Syrens." 5th. "Amphinome and Anape." 6th. "Perfeus ftriking off the Head of Medufa." 7th. "The Rape of Ganymede." 8th. "The Triumph of Bacchus."

Michel Dorigny was born at St. Quentin in 1617, and died at Paris in 1665, the difeiple and brother-in-law of Vouet, he eonftantly imitated the ftyle of his mafter. Some pictures were executed by him for the chateau of Vineennes. Dorigny engraved more than a hundred pieees from defigns by his father-in-law, in whieh he has faithfully preferved the character of the originals. His execution is bold and decifive; he well knew how to economife his light, and to impart to his draperies an eafy and natural caft. But he was not equally fuccefsful in drawing, efspecially of the hands and feet of his different perfonages. He exeeuted, from his own invention, a feries of fix plates, reprefenting the feftivals of fauns, fatyrs, bacchantes, &c. in folio; and from Vouet he etched the following:

"The Nativity of our Saviour," in folio. "Apollo affuming the Guidance of the Chariot of the Sun," in folio. "Apollo killing with his Arrows the Serpent Python," in folio. "Peaee defcending on Earth," in folio. A landfcape, in whieh the Holy Family is introduced, a fmall folio, dated 1649. "The Harpies driven from the Palace of Phineas by the Children of Boreas," in folio. "Venus at her Toilet," fmall folio. "Venus and Hope plucking the Wings of Love," fmall folio. "Mercury and the Graces," from the fame. "The Rape of Europa." "Iris tearing the fatal Hair from Dido on the funeral Pile," in folio. "The Kings of Arabia and Saba, with their Attendants bringing prefents to the Infant Jefus." This fubject was executed for the cieling of the hotel de Fermes, and is engraved in the manner of a frieze, on four plates.

Nicholas Robert was born, aecording to fome accounts, at Langres, and from others at Orleans, in 1610, and died at Paris in 1684. Befides his productions as a painter, Robert engraved the moft rare flowers, birds, and the animals of the royal menagerie. He alfo etched, in conjunction with Gerard Audran, fix cielings, and fix plates of vafes from George Charmeton.

Gregoire Huret was born at Lyons in the year 1610, and died at Paris in 1670. His engravings are numerous, and many of them from his own defigns. "His compofitions are neither learned nor judicious, and his drawing by no means correct. He worked with the graver only, in a coarfe, heavy ftyle, apparently a diftant imitation of that of Poilly." Such is the account which Strutt gives of this artift; Watelet fpeaks much more favourably, but our countryman will probably be found nearer the truth.

We begin our lift of his principal works, with the portraits which he has engraven, and which are of the folio fize.

Jaques Bouceau equerry, lord of Baranderée, from A. de Vries. Francis de Bonne, duke of Lefdiguerres, conftable of France, from Dumouftier. This piece has a border with emblematical figures. Pierre Seguier, ehancellor of France, in an ornamented frame, figned Greg. Huret fecit. An allegorical portrait of the author of the work entitled "De la Souveraineté de Roy." A feries of thirty-two plates illuftrative of the paffion of love. The lifts of his hiftorical and allegorical engravings, whieh are alfo of the folio fize, are,

"The Condemnation of St. Stephen." "St. Peter preaehing to the Chriftians, who receive the holy Spirit." "A Holy Family, with St. Catherine and another Saint." "The miraculous Image of our Lady of Lieffe," infcribed to the duchefs de Nemours, 1655, a large folio. "Chrift with the Crown of Thorns." "Louis XIII. and Queen Anne prefenting the Dauphin to the holy Virgin," dated 1638. "Wifdom, Peace, and Eloquence fupporting the Arms of Richelieu," 1638. "Frontifpiece to the Hiftory of the civil Wars of France."

The date of the birth and that of the death of Jaques Bellange have not been recorded. Strutt fays that he flourifhed towards the clofe of the laft century, and Huber that he was born fome time about 1610, but both agree that he was a native of Chalons. He learned the rudiments of drawing under Claude Henriet, and afterwards ftudied at Paris in the fchool of Vouet. Bafan fays of him that "he was a bad painter and a worfe engraver," and that, "in his etchings, which are from his own compofitions, we find much fire, more caprice than judgment, little correctnefs, and very bad tafte;" but Mr. Strutt thinks this fentence too harfh, and, commenting on Bellange's plate of the Virgin Mary and infant Chrift, fays that the ftyle of engraving in which it is executed, "however fingular, is by no means deftitute of merit: his drawing appears to me to be incorrect rather from affectation than want of knowledge; the whole figure of the child is well executed; there is indeed an awkwardnefs in the turn of the figure of the Virgin, and the eharacter of her head is childifh." His etchings in general are flight, but free, and often mafterly; and he fometimes, in the nudities of his figures, introduced ftippling with the graver, by way of harmonizing and foftening the roughnefs of his etching.

Bellange left behind him fifty engraved plates, of which the principal, of a folio fize, are as follows:

"The Holy Family, with St. John and St Catherine," a large upright. "The Annunciation," of a fquare form. "The Refurrection of Lazarus," an upright. "The Adoration of the Magi." A fet of three fingle figures of Eaftern Kings, *viz.* Cafpar of Tarfus, Melchior of Nubia, and Balthafar of Sheba. "Chrift bearing the Crofs," large. "A dead Chrift, fupported on the Knees of the Virgin," fmall folio. "The Three Marys vifiting the Sepulchre." "St John the Baptift in the Defert." "The Martyrdom of St. Lucia." "The Death of Virginia." "Adonis bearing Diana on his Shoulders." "A back View of a Warrior ftanding, and a Female leaning on a Drum, with a City in the diftance." A feries of five female figures ftanding in different attitudes. A fmall oval of "St. Mary Magdalen, with her Hand on her Bofom."

Pierre Daret was born at Paris in the year 1610: after acquiring the rudimental principles of engraving in Franee, he went to Italy to complete his ftudies, and remained there a confiderable time; but finally returned to his native city, and

and died there at a very advanced period of life. He was not only a defigner and engraver, but had fome pretenfions to literature. Florent le Comte informs us that he compofed a life of Raphael, which was printed in the year 1656, but it is little more than a free tranflation of that from the pen of Vafari. A portrait of Raphael is prefixed to the volume.

Strutt's fummary of the talents of this artift is as follows: "his works are chiefly performed with the graver, without any other affiftance. The mechanical part of his engraving is cold and filvery, the effect flat and unharmonized, and the drawing of the naked parts of his figures is frequently incorrect and heavy, more efpecially the extremities. His works are in number very confiderable, amounting to upward of two hundred and ninety-fix prints." According to Huber they are much more numerous; and many of them are marked with his cypher, for which the reader is referred to our plate of the monograms, &c. of the French fchool of engravers.

The following are fome of the hiftorical pieces executed by Daret from different mafters, and are all of the folio fize.

"St. John feated in the Defert, with a Lamb on his Knees," from Guido. "The Madonna fuckling the Infant Jefus," from Annibal Caracci. "St Peter delivered from Prifon," after Dominichino, a large upright. "Jefus laid in the Sepulchre," from Baroccio. This piece appears under the name of P. Mariette. "A Holy Family, in which is introduced an Angel prefenting Fruit to the Infant Jefus," from S. Vouet. "A dead Chrift mourned over by holy Women," from the fame. "St. Jerome feated in the Defert, writing," from Blanchart, a half-length figure. "Thetis requefting Arms for Achilles," from the fame. "Charity, with Five Infants," from the fame. "The Vifitation, or meeting of the Virgin Mary and St. Elizabeth," from M. Corneille the father. "The Virgin feated with the Infant Jefus," from the group of Jac Sarazin. Upwards of a hundred fmall plates for a work entitled "La Doctrine des Mœurs," publifhed by M. Le Roy, of Gomberville, in 1646, from the defigns of Otho Vænius.

Among the portraits of P. Daret, we find, of the quarto fize, a buft of Alexander the Great, with illuftrations from Plutarch. Pope Alexander VIII. Charles I., king of Great Britain. Henry of Bourbon, prince of Condé, firft prince of the blood. Charlotte Marguerite de Montmorency, princefs of Condé. Donna Olympia Maldalchini. Bernard de Saxe, duke of Weimar. Henry de la Tour d'Auvergne, vifcount de Turenne.

And in folio, queen Anne, with the two princes on the throne, for the Hiftory of Mezeray. Marguerite Gafton, duchefs of Orleans, 1652. Louis le Fevre de Caumartin, chancellor of France. Ladiflaus IV., king of Poland, engraven in 1645.

Louis Boullongne, the father, was a native of Picardy, and born in 1610. After paffing fome years in Italy, he returned to France, and fettled in Paris, where he died in the year 1674, having for fome time enjoyed the reputation of being an excellent artift, and the honour of being profeffor to the French Academy.

He engraved from his own pictures the Miracle of St. Paul at Ephefus, and the Decollation of that Apoftle at Rome. He alfo, during his refidence at Rome, executed a plate from Guido of the Rape of Helen.

Boullongne left behind him two fons, of whom Bon, who was born at Paris in the year 1649, and died in that city in 1717, was the elder. While under the tuition of his father, he difplayed confiderable talent, he however paffed five years at Rome, after which he proceeded to Lombardy, where he ftudied the works of Correggio, and the Caraccii. An able defigner, and good colourift, his manner partook of the perfections of both thefe great mafters; he likewife excelled in compofition; and all his productions, but particularly his Refurrection of Lazarus, are ftamped with a grand character.

Bon Boullongne engraved feveral pieces of his own compofition, among which are, "a Holy Family," in folio. "St. John preaching in the Defert," a large upright. "St. Bruno feated in a Landfcape," and its companion, both in folio. The frontifpiece to an almanack, engraven in 1694; and, a fatire againft the author of Mercure-galant, who amufed himfelf at the expence of painters: beneath are the following words: "Ah ha, galant vous raifonnez en ignorant."

Louis Boullongne, the younger brother of Bon, was born at Paris A.D. 1654, and died in the fame city in 1734. Having received the fame inftruction as his brother, he fet out for Italy. During his ftay in Rome he copied feveral of Raphael's pictures; and it was from his copies that thofe celebrated works were executed in the tapeftries of the Gobelins. On his return from Italy he was admitted into the Royal Academy, in confequence of his pictures of "Auguftus fhutting the Temple of Janus," the "Flight into Eygpt," painted for the church of Notre Dame, and the "Prefentation in the Temple." After the death of Ant. Coypel he was nominated firft painter to the king, and chevalier of the order of St. Michael.

He etched the following plates, which, though fpirited and free, are not correctly drawn. "A Holy Family," in 4to. in which the infant Jefus is holding a bird in his hand. Another "Holy Family." "A dead Chrift, furrounded by Saints, Women, and his Difciples," in folio. "The Martyrdom of St. Peter," an upright, in folio. "The Martyrdom of St. Paul," in folio, its companion. "The Flagellation of St. Andrew," from Paul Veronefe, in folio. "St. Bruno," in folio. "A Roman Charity," in folio.

Abraham Boffe was born at Tours A.D. 1610, and died at Paris in 1678. Befide his engravings, which amount (according to Huber) to eight hundred in number, and the greater part of which are from his own defigns, he is the author of certain effays on perfpective and architecture, which have been printed; and he has the honour of being the firft Frenchman who produced a treatife on the art of engraving; a work of which M. Cochin has given a new and improved edition, and of which there is an Englifh tranflation.

Under what mafter he ftudied, his biographers have not mentioned. In the ftyle of his engraving, he was the evident imitator of the coarfer manner of Callot, and for the moft part employed the hard varnifh, (for which fee the article ETCHING,) which that artift invented. The execution of his plates is accordingly clear and pleafing, poffeffing much of that peculiar brilliancy of line which the graver produces; yet his lights are in general too much fcattered.

Boffe drew with a certain degree of fpirit, but rather with fpirit than with truth, and finifhed his etchings by partially re-entering the corroded lines with the graver: but his practice, as well as his theory, was fettered by a fuperftitious preference, which appears to have originated in Germany, for the clear and clean cut lines which the latter inftrument produces. Hence he imitated, whilft etching, the work of the graver, and hence, in his treatife, he erroneoufly taught others to eftimate the value of etching, by its degree of

of resemblance to the lines produced by the graving tool; a very false criterion of merit, and upon which Watelet justly remarks, that it is better to impart to each species of engraving the character peculiar to it; to leave to etching its freedom and playfulness, and to the graver its wisdom and severity.

Bosse was a member of the Royal Academy of Paris, but the independence of his character led him to resist the real or imaginary despotism of Le Brun, who at that time (says Huber) reigned over the arts with imperious sway, and he was expelled in consequence. Of his numerous engravings, the following will probably be found most worthy of notice:

Portraits of the queen dowager sitting, with the young king of France and his brother standing by, in folio, and without the signature of the artist. The portraits of cardinal Richelieu, and of Callot the engraver, with his epitaph, are also of the folio size. The king and queen of France addressing their prayers to the holy Virgin, of the proportions of a frieze. "Judith with the Head of Holofernes." "A Figure wrapt in a Mantle, leaning against a Tree," engraved by Bosse and Mellan. "The preparation of a Christian Soldier for spiritual Warfare." "The French Army." "The Siege of la Motte." "The Reduction of Mantua." All of the folio size. "The Adoration of the eastern Kings," in 12mo. "The Virgin sitting, with the infant Jesus on a Pedestal, behind her St. Joseph," 12mo. "The History of Dives and Lazarus," six pieces in folio. "The History of the Prodigal Son," in folio. "The Parable of the wise and foolish Virgins," seven pieces in folio. "The seven Works of Misericordia," in folio. "The Miraculous Image of St. Anne," folio. "The magnificent Procession of the Hunt of St. Genevieve," folio. "Ceremony observed at the contract of marriage between Ladislaus IV. king of Poland, and Maria de Gonzague, which took place at Fontainbleau in 1645," folio. "Marriage ceremony of Louis XIV.," folio. "The hall of Charity," folio. "The Gallery du Palais Marchand," folio. The painter, sculptor, engraver, and printer, engaged in their respective employments, a set of four plates, folio. A school-master and school-mistress, two plates, folio. The four elements in the costume of the times, demi-figures, four small pieces in 4to. The four quarters of the globe, in medallions, four plates in 4to. The four seasons, represented by subjects of conversation, a set of four plates, in folio. The five senses, represented in the same manner, on five folio plates.

Bosse also engraved a few plates from Bourdon, Bellange, Delestain, Paul Farinati and others, and has been censured for devoting (either from choice or necessity) a portion of his time to trifling and temporary subjects, such as fans, and affairs of French gallantry, which we forbear to enumerate.

Claude Dervet was born at Nancy in the year 1611, and died in 1642. He was the pupil of Israel Henriet, and the friend and fellow-citizen of Callot, whose style of engraving he successfully imitated.

Of all his engravings, the two following are only known to us; they are both of the folio size.

Charles IV., duke of Lorraine on horseback, surrounded with military insignia, with the following inscription on a cannon, C. Dervet fec. 1628. This piece was engraven for a book entitled "Triumpho de S.A. Charles III. Duc de Lorraine, à son Retour dans ses Etats," Nancy, 1604. The invention of this piece is attributed to Callot, and the little view, which accompanies the portrait, of the city of Nancy, is engraven by F. Clerc. "A Pallas on horseback, holding, in her right Hand, a Club." The invention of this piece has also been attributed to Callot.

Pierre Lombart was born at Paris in the year 1612, and is supposed to have frequented the then popular school of Vouet; but it is not known where, or under whose instruction, he acquired the rudiments of the art of engraving. After exercising his profession for some time in Paris, he repaired to London, and the reader will find his principal works, and the style of his engraving spoken of in our account of the origin and progress of English engraving; and his cypher, or mark, among those of the French school of engravers.

Of such of his works as were executed in France (in addition to those which we have already mentioned) we are enabled to supply the following list:

"St. Michael's Victory over Satan, or the Commencement of the Millennium," after Raphael, from the celebrated picture which was formerly at Versailles. "The Virgin and Child seated on a Throne," from Annibal Caracci. "The Adoration of the Shepherds," from Poussin. An "Holy Family," in which the infant Jesus is caressing St. Joseph; all which are of the folio size.—The following portraits are also from the graver of Lombart. The painter Walker, from a picture by himself, in folio, an oval. Sir Samuel Moreland, after sir Peter Lely, in 4to. an oval. Anne Hyde, duchess of York, from the same painter, in 8vo, an oval. Jeremy Taylor, with a Latin inscription, folio. Thomas Morant, marquis du Mesnil, master of requests, folio, an oval. Gabriel Chassebras, de la grand maison, master of the mint, folio. Jean Dallaens, minister of the gospel, from W. Vaillant, folio. Anthony, duke de Grammont, from the same, folio. Pierre de Massart, counsellor to the king, from Cl. le Febure, folio. Christianus Ludovicus, Dei gratia, dux Megapolitanus, princeps Vandalorum; inscribed Richart de la Mane pinx. P. Lombart sc. Parisiis, 1670, folio. Vincentius Nevelet, in suprema regia curia senator, folio. William Davison, first physician to the king of Poland, after Schulz, folio. Brianus Waltonus, S.T.D. Cantab. coll. folio. This is a scarce print, but the following is among the scarcest and best of the engravings of Lombart, *viz.* "In effigiem Domini de la Fond," a print perhaps better known under the title of "Gazzetier a Hollande," after H. Gascard.

Jean Morin was born at Paris in the year 1612, or thereabout, and died in the same city in 1666. According to Strutt's account of him, "he was a man of great ability; he studied painting under Philip Champagne, but relinquished that art in order to follow engraving. His plates are executed in a singular style; a mixture of lines and dots, harmonized with each other so as to produce a very agreeable effect. They are chiefly etchings; for he does not appear to have understood the management of the graver, by any means equal to that of the point. His portraits, which form the more numerous part of his works, are many of them executed in a masterly manner, and though not finished with all the precision and delicacy which the graver is capable of producing, manifest at least the good taste, freedom of hand, and knowledge, of the artist." Among the more estimable of his works, are the following:

"Head of St. Vincent, in the chapel of St. Germain of Auxerre." This is really the portrait of Morin himself painted by his friend Champagne. From the same painter he has engraved, of the folio size, "The Adoration of the Shepherds." "The Virgin Mary caressing the infant Jesus." "The grand Crucifix," a capital piece engraved

on

on three plates. "Jefus Chrift dead on the Crofs." "The Virgin carried up to Heaven by Angels," from a ceiling. Two plates, companions, of which the fubjects are, "St. Peter, and St. Paul," half-lengths. Another pair, of "St. Jerome and St. Bernard." Two pieces, reprefenting "Groups of Angels in the Air," in quarto. A frontifpiece to the pfalms of David, in 8vo. "The Virgin holding a Bunch of Flowers, with the Infant Jefus on her Knees, who is placing a Rofe in the Bofom of his Mother," Raphael pinx. with the motto "Dilectus meus mihi," folio. "The Virgin adoring the infant Jefus fleeping on Straw," from Titian, folio; a beautiful fpecimen of the engraver's ability. "The Virgin contemplating the Body of Jefus extended on the Earth," from Caracci. "A Landfcape with Ruins, under which Goats are feen browfing," from Claude Lorrain, in 4to. In this, as in moft of the following, Morin has attempted to finifh the diftances with dots, but with no great fuccefs. A landfcape with a ruftic houfe, and in the fore ground a man driving cows, from Fouquier, in folio. A mountainous landfcape, in the fore ground is feen a traveller on horfeback, preceded by a man on foot, from the fame; large folio. Four landfcapes, with ruins and figures, from Corn. Polenbourg, in folio. A landfcape, on one fide of which is an antique fountain, and on the other ruins, from L. B. Corneille, in folio.

The following twenty-four of the moft beautiful portraits of Morin, are from Champagne, and are of the folio fize. Louis XIII. king of France, an octagon. Anne of Auftria, Regent, bare-headed. Anne of Auftria, in weeds, and a black mob-cap. Jean Baptifte Amador, abbe of Richelieu. Armand, cardinal de Richelieu, an octagon. Jules, cardinal de Mazarin. Corneille Janfenius, bifhop of Ypres. Jean Paul de Gondy, archbifhop, and afterwards cardinal of Rez. Pierre Bertier, without letters, his hair curled, fmall muftachios, and the bifhop's crofs. Francis de Sales, bifhop of Geneva, without the painter's name, an octagon. S. Charles Borromee, cardinal and archbifhop of Milan, an oval. Jean Pierre le Camus, bifhop of Bellay, an octagon. Jean du Verger of Haurane, abbe of Saint Sarin. Michael de Morillac, keeper of the feals. Michael Tellier, fecretary of ftate. Jaques Tubœuf, prefident of the chamber of accounts. Rene de Longuevil, feigneur de maifon, prefident a mortier. Henri de Lorraine, count d'Harcourt. Nicolas de Neuiville, marquis of Villeroy. Charles de Valois, duc d'Angouleme. Robert Arnauld, lord of Audilly. Vincent Voiture, of the French academy. Jaques le Mercier, firft architect to the king. Antoine Vitré, a celebrated printer at Paris, an octagon.

The following portraits by Morin, are from various other mafters:

Jaques-Agufte de Thou, prefident of the parliament; Ferdinand pinx. in folio. Francis Auguftin de Thou, prefident of the Parliament; Ib. pinx. in folio. Guido, cardinal de Bentivoglio; A. Van Dyke pinx. in folio. An anonymous portrait of a lady. Ib. pinx. in folio. This is the portrait of the countefs de Boffu. An anonymous portrait of a man with a fhort beard, and the head bare. Ib. pinx. This is the portrait of Charles de Mallery, engraver and print-feller at Antwerp. Dom Gregoire Tarriffe, fuperintendant general of the congregation of St. Mavr. Dunftan pinx. Hieronyme Franeque, painter to the king. Se ipfe pinx. an octagon, in folio.

Jean Boulanger, was born at Troyes about 1613, and died at an advanced age, in Paris, where he publifhed a great number of prints, both of his own compofition, and from other mafters.

Boulanger is prefumed by Strutt to have formed his firft manner of engraving on that of Francis de Poilly; he was the contemporary of Morin, and like him endeavoured to impart a foftnefs and mellownefs to his flefh by dotting or ftippling. But Morin produced his dots by aqua-fortis, while Boulanger employed the graver; and as the draperies and back grounds of his prints are engraved in lines, with little or no intermixture of ftippling, an effect of more or lefs of diffonance is generally produced, and the back grounds of his portraits and his Madonnas are more efpecially coarfe and harfh; but notwithftanding this defect, and that he did not draw the naked parts of his figures either with correctnefs or fine tafte, the peculiarity of his manual execution, and the care which he has manifefted, have obtained him many admirers. In fubfcribing his name to his engravings, he has frequently joined the J of his baptifmal name to a fmall b, in fuch a manner as greatly to refemble an H, and hence it is fometimes erroneoufly read Houlanger, and has fometimes been fo inferted in printfellers' catalogues.

Of the following fubjects, thofe which are mentioned firft are of his own invention.

Two bufts, the one of our Saviour, the other of the holy Virgin, with her eyes caft down, in folio. An oval buft of the Virgin, with a border of laurel leaves, in folio. "The Virgin, with the Infant Jefus," a half-length figure, in folio. Another of "The Virgin with the Infant Jefus on her Knees, who is taking a Crofs from the Hands of St. John," and alfo a half-length figure, without a name, in folio. "The Virgin fitting with the Infant Jefus on her Knees, prefenting Pinks to him," a print known under the name of "La Vierge à l'oeillet," from Raphael, folio. A buft of the Virgin with her eyes caft down, having the following infcription: "Mater amabilis," from the fame; in folio, in a circle. "The Virgin holding the Infant Jefus, to whom St. Jofeph is giving fome Cherries," from Caracci, large folio. "The Virgin of Paffau," from Salario, folio. "The Virgin fitting with the Infant Jefus afleep in her Arms," from Guido, in folio. "The Virgin, with the Infant Jefus and the little St. John who kiffes her Feet," from the fame, formerly in the cabinet of the French king, folio. This print has a very ftriking effect. "Holy Family," from Noel Coypel, the father, folio. "A Holy Family," here the Virgin is reprefented kiffing the Infant Jefus," half-length figures, without the name of the painter, which is Nic. Loir, in 4to. "An Infant Chrift," infcribed "Salvator Mundi, miferere nobis," from the fame, 1651, in 4to. "Chrift bearing his Crofs," by Nic. Mignard, in folio, large. "A Virgin holding the Infant Jefus ftanding, St. John embracing his Knees," from P. Mignard, in 4to. "The Defcent from the Crofs," from a painting in the church of St. Benedict, painted by S. Bourdon, a large folio. "Jefus Chrift carried to the Sepulchre," from the fame mafter, a large folio. "A large Crucifix," with a back ground, from Ch. le Brun, a large folio. A piece of fuperftitious folly, entitled "The Interior of the Virgin, with the Holy Ghoft next her Heart," from the fame. Buft in folio. "The venerable Père Michael le Nolle, to whom the Virgin prefents a Crown," from the fame, in 4to. "St. Francis de Paule, Founder of the Minimes," from S. Vouet, in folio. "The Body of Jefus Chrift borne away by Jofeph of Arimathea," from a picture by Claude le Febure, a large folio. "The magnificent Proceffion which took place at Paris on the day that Louis XIV. attained to his Majority," from F. Chauveau.

Boulanger alfo engraved a confiderable number of portraits, among which is that of Charles II. of England.

Simon Renard de St. André was born at Paris in the year

year 1614, and died in the fame city in 1677. He was educated a painter, and ftudied under Louis Bolrum, but the following etchings, which are held in fome eftimation by the collectors of French art, are from his hand. "An Infant Chrift contemplating the Crofs, which he holds on his Knees." A fet of forty-fix folio plates from the paintings and fculpture in the gallery of the Louvre, confifting chiefly of bloated allegory, and fulfome compliment to Louis XIV. after Le Brun. "The Crucifixion," alfo in large folio, and from the fame painter. This appears without the name of André, but is known to be from his hand. F. de Poilly has engraven from the fame original.

Giles, or Egidius Rouffelet, was born at Paris A.D. 1614, and died in the fame city in 1686. He appears to have ftudied in the fchool of De Poilly and from the works of Bloemart, for his ftyle partakes occafionally of the merits and peculiarities of both thofe artifts. Rouffelet drew with tolerable correctnefs, and difcriminated the textures of the various fubftances reprefented in his engravings with more fuccefs than moft of his predeceffors.

More than three hundred and thirty of his prints have been enumerated, of which number the following will probably be found moft worthy of the notice of the connoiffeur.

"A Holy Family," from Raphael, dated 1650, in folio. In this piece is reprefented the Virgin fitting before the Infant Saviour, while St. John is prefenting him with a bird. "A Holy Family," from a painting of Raphael, formerly in the poffeffion of the duke of Orleans, engraven in 1656, folio. Here St. Jofeph is kneeling and prefenting flowers to the Infant Jefus, who is feated on the knees of his mother. Another "Holy Family," from a painting of Raphael, formerly in the poffeffion of the king of France, known under the name of "The Virgin of Fontainbleau, or the fair Gardener." In this piece the Virgin is feated, with the Infant Jefus by her fide, and the little St. John kneeling before him. "A Holy Family," from a painting of Raphael, formerly at Verfailles, and which Louis XIV. caufed to be engraven by G Edelinck, folio. "St. Michael overcoming the Devil," from a picture by the fame mafter, formerly in the cabinet of the French king, a piece frequently engraven, folio "The Virgin with the Infant Jefus, to whom St. John is prefenting a Crofs," from Guido, a piece falfely marked with the name of Caracci, folio. "The Annunciation," from Guido, folio. "St. Francis in Meditation," from the fame, folio. "David with the Head of Goliah," from the fame, folio. A fet of four plates of the "Labours of Hercules," from the fame mafter, formerly in the cabinet of the French king, in folio; *viz.* 1. "Hercules flaying the Hydra of Lerna;" 2. "Hercules ftruggling with Archelaus;" 3. "Hercules flaying the Centaur Neffus, the Ravifher of Dejanira;" 4 "Hercules on the Funeral Pile." Thefe are very diftinguifhed prints, and of the upright form. "David playing on the Harp," from Dominichino, folio. "St. Catherine prefenting a Lily to the Infant Chrift, lying on the Knees of his Mother," from P. de Cortona, folio. "Jefus Chrift carried to the Sepulchre," from a painting by Titian, in the cabinet of the French king, a large folio, finely executed. A fet of four plates of the Evangelifts, from pictures by Valentino, formerly in the cabinet of the French king, nearly fquare. "The Virgin Mary," from Jacques Blanchard, in folio. "Eliazar prefenting a Bracelet to Rebecca," from a celebrated picture by Pouffin, formerly in the cabinet of the French king, in folio. The "Holy Family," in which the Infant Jefus is holding an apple, and fitting above a fountain, from Bourdon, in folio, "St. John the Evangelift," from the fame, in folio. A large "Crucifix," with a dark fky, in which are feen two groups of little angels, and two heads of cherubims; in the back ground, the city of Jerufalem, from le Brun. "The Body of Jefus Chrift placed before the Virgin at the Foot of the Crofs," from the fame, both in large folio. "A Holy Family," from the fame, in folio. Here the Infant Jefus is reprefented as if expounding the facred fcripture. "A Magdalen," infcribed "Remittuntur ci peccata," from the fame, a half-length figure in an oval, folio. "St. Bernard kneeling before the Virgin," from the fame, in folio. "St. Therefa in Contemplation," from the fame, folio. "The Great Thefe of count de St. Pol," in which Louis XIV. is feen on horfe-back, from the fame.

Portraits.—Francis Hedelin, abbé of Aubignac. Egid. Rouffelet ad vivum fc. 1663, in 4to. Charles le Fevre, abbot of St. Geneviéve, infcribed G. Rouffelet del. et fc. in folio. Francis Boulart, abbot of St. Geneviéve, in folio. Charles de Valois, duke of Angoulême, oval, in folio. Meffire Pierre Seguier, chancellor of France, with fupporters, from Le Brun, in folio. Richard de Belleval, chancellor of the univerfity, from the fame, in folio. Frontifpiece to the Polyglott bible, after Sebaftian Bourdon, an engraving of confiderable merit, wherein Fame is reprefented bearing the medallion of cardinal Mazarin, and Hiftory prefenting the Holy Scriptures to France.

Samuel Bernard was born at Paris in the year 1615, and died there in 1687. He is faid to have been a pupil of Vouet, and to have painted in frefco and in miniature. As an engraver, his merit is inconfiderable: his drawing is incorrect, his draperies ftiff and heavy, and his chiaro-fcuro black and inharmonious: yet there is a certain degree of neatnefs in his execution. His plates confift chiefly of etching, the lights being foftened by ftippling with the graver.

Bafan has miftakenly fuppofed that there were two artifts of this name, from noticing two feveral admiffions of Samuel Bernard to the French Academy; but the truth is, that our artift was originally admitted in the year 1655, was expelled on account of his adherence to the Proteftant religion, (on the revocation of the edict of Nantes, in 1681,) and was afterwards re-admitted to a profefforfhip, on recanting his faith and becoming a member of the Catholic church. His moft efteemed engravings are as follow, beginning with his portraits, which are in folio.

Louis XIV. prefumptively from a picture by Bernard himfelf, an oval. Sebaftian le Preftre de Vauban, from F. de Troy; Charles Louis, count palatine, duke of Bavaria, from Vandyke, dated 1657. Louis Garnier, fculptor and painter. Philippe, comte de Bethune. Anne Triftan de la Beaume de Luze, archbifhop of Paris, from F. de Troy.

Of his hiftorical works, which are alfo of the folio fize, the beft are, "Attila, terrified by the Apparition of St. Peter and St. Paul in the Air, abandoning the Siege of Rome," from Raffaelle. "The Nativity of our Saviour," from Rembrandt. "Aftyanax difcovered by Ulyffes in the Tomb of Hector," from S. Bourdon, a large plate. "A Repofe during the Flight into Egypt," from Correggio. "The Crucifixion," from Ph. de Champagne. "The Body of Jefus Chrift before the Virgin," from the fame. "The Afcenfion of Jefus Chrift," from the fame. "A Peafant on horfeback, driving Cattle to Pafture," after Jean Foreft. "The Image of Concord," an allegory from Le Brun. "A Shew of Cattle," from Caftiglione. "Flight into Egypt," infcribed "Dei, et matris, et filii, fugam in Egyptum," from Guido.

Jean Lanfant was born at Abbeville about the year 1615, and died at Paris, where he principally refided, in 1674. He was the pupil of Claude Mellan, whofe mode of engraving

graving he ufually imitated, but like all followers, was conftantly behind his mafter. Many of his prints are performed with fingle courfes of lines, like thofe of Mellan; but he alfo imitated, with fomewhat better fuccefs, that artift's mode of engraving, wherein he employed crofs hatching. His plates are executed with the graver only, and though fufficiently neat, are cold and taftelefs.

The abbé Marolles collected an hundred and eighteen of this artift's productions, which are chiefly portraits, and of which the following are in moft efteem. They are all of folio dimenfions. Nicholas Blaffet, architect and fculptor to the king, infcribed "Jo. Lenfant Abbavillacus fc. Parifiis, 1658. Francifcus du Tillet, regis confiliarus. Lenfant ad vivum faciebat, 1663. Francifcus de Harlay, Rothomagenfis archiepifcopus. Champagne pinx. Lenfant fe. 1664. Ludovicus Boncherat, D. de Compana, &c. Id. fec. 1670. Ægidius la Maitre, dominus de Ferrieres, &c. Id. fce. 1662. Andreas de Pagot, fupremi rei monetalis fenatus. Id. fec. 1662. Henricus d'Argonges, abbas fancti Quintini, Jo. Lenfant ad vivum faciebat, 1672. The buft of our Saviour, after Raphael, an oval. "A Madonna with the Infant at her Breaft," after Caracci. "The Virgin in the Act of Adoration," after Guido, oval. Joh. Lenfant del. et exc.

Louis Teftelin was born at Paris in 1615, and died in the fame city in 1655. He was the pupil of Vouet, and, according to the French writers, joined to a brilliant genius a correct tafte, and a love for ftudy. So completely mafter was he of the theory of his art, that Le Brun himfelf was even not afhamed to confult him. In 1650 he was nominated profeffor to the Royal Academy, and he continued his labours with indefatigable perfeverance.

His younger brother, Henry, equally diftinguifhed himfelf as a painter, and, like Louis, was nominated profeffor to the Academy. He was the author of a work, entitled "Sentimens des plus habiles Peintres fur la Pratique de la Peinture et Sculpture, mis en tables de preceptes, avec plufiers difcours Academiques, ou Conferences tenues en l'Academie Royale des dits Arts, &c." Par Henri Teftelin, peintre du Roi, profeffeur et fecretaire en la dite Academie.

For this work Louis engraved feveral plates, and, among others, the following:

"The gathering of the Manna in the Defert," after Pouffin, in folio. "The Holy Family," from Pouffin's celebrated picture at Verfailles, engraved in fingle ftrokes. "St. Michael's Victory over the Devil," which is alfo engraven without crofs hatchings. A fet of fifty fmall quarto plates, alfo executed for his brother's book, and from his own compofitions, of which the fubjects are children at play, and an expiring Chrift, with the city of Jerufalem in the back ground; an anonymous engraving, but one of the works of Teftelin.

We are now arrived at the chronological ftation of Sebaftian Bourdon, of whofe merits both as painter and engraver, we have already treated under the article Bourdon, Sebastian: yet a more copious lift of the engravings of fo great a genius, than we were at that time enabled to give, may not prove unacceptable to the reader.

"The Return of Jacob," in folio. "Abraham's Servant accofting Rebecca," in folio. "The Return of the Ark," in folio, a fcarce and fine print, of which the compofition is highly commended by fir Jof. Reynolds. "The Annunciation." "The Angel appearing to the Shepherds." "The Flight into Egypt," wherein the artift has introduced a mutilated ftatue. Another of the fame fubject, in which Jofeph is watering his afs. Another, in which the Holy Family are croffing a wooden bridge, in order to reach a boat. Another, wherein the Holy Family are walking, and St. Jofeph leading the afs. Another, in which the Virgin Mary is mounted on the afs, which is led by St. Jofeph through fome thickets. Another, in which St. Jofeph is feen leading the afs by the bridle, in defcending a hill. A Holy Family refting, in which the infant Chrift is feeding a lamb. Another, in which the infant St. John is feen holding the foot of the lamb. Another, here the Virgin is reprefented wafhing linen. This piece is beft known under the title of "La Savonneufe;" it is in quarto, and nearly fquare. "The Baptifm of the Eunuch," in folio. "Jefus healing the Sick," in folio, nearly fquare. "The Good Samaritan," in a landfcape, in folio. "A Peafant giving Drink to one of his Children," in quarto. "Profperity," in quarto. A fet of five plates of the Senfes, in quarto. A feries of fourteen plates, reprefenting the liberal and the focial virtues, dedicated to M. de Colbert, in ovals and octagons. A feries of fix grand landfcapes, in large folio, nearly fquare. A feries of fix beautiful landfcapes of a fmaller fize, in folio, and nearly fquare. Two beautiful landfcapes, infcribed S. Bourdon inv. fculp. et exc. in folio. "The Seven Works of Mercy," with a dedication to M. de S. Bourdon.

Jean le Pautre, or le Potre, was born at Paris in the year 1617. In the early part of his life he was placed under a working goldfmith, where he acquired the firft rudiments of ornamental drawing and engraving, and, in particular, acquired great facility in drawing with pen and ink, which probably led his mind to etching, while it helped to familiarize his hand to the ufe of the point. The authors of the "Manuel des Curieux et des Amateurs de l'Art," fay that he alfo ftudied under an architect, which feems highly probable, when we confider the fubjects of the greater part of his plates, which confift of architectural decorations, vafes, ceilings, and, in fhort, ornaments of almoft every kind, which are executed from his own defigns, and abundantly prove the fecundity of his inventive powers. Florent le Comte juftly fays of him that "it is hardly poffible to find an engraver who has produced more inventions than he," and that "every profeffor of the liberal arts or mechanics, may find fomething in his works which will at leaft repay the trouble of examination."

Le Pautre was admitted a member of the French Royal Academy of Arts in the year 1677, and died at Paris in 1682. The ftyle of his ornament, to fay the beft of it, is rather rich than elegant: it has been called folid; but it is too often cumberfome and heavy, when compared with the better tafte of the Greeks, or even that of the French in more recent times. The ftyle of his engraving partakes of the fame heavinefs, and his chiaro-fcuro is deficient in harmony and tendernefs. He muft have both defigned and engraved with great rapidity, for in the collection of Mariette were fourteen hundred and forty plates from compofitions of his own; among the beft of which, befide his large volume of ornaments, the following may be mentioned: Portrait of himfelf, in a border of flowers, fupported by genii, in folio, dated 1674. Louis XIV. feated in his cabinet in a Roman coftume, dated 1634, a fmall plate. The little good man, in folio: (this is the portrait of a mendicant friar). Portrait of Jean Robert, undertaker, in folio. Six plates of the hiftory of Mofes, in folio. Twenty-two mythological plates, fmall folio. Twelve landfcapes, with views of gardens and grottoes. Six plates containing fountains and jets d'eau, in the Italian ftyle. Six plates in the manner of friezes, ornamented with various mythological fubjects, in folio. Twelve plates of vafes, adorned with children and mythological fubjects, with figures in the antique ftyle, in folio. Six plates of fea-ports, in folio. Six plates of the vifions

visions of Quevedo, each with its appropriate title, and eight French verses, in quarto. Three large plates, each inscribed with eight French verses, relative to the coronation, consecration, &c. of Louis XIV. Three large perspective views of the canal of Fontainbleau, with the baptism of the Dauphin introduced, folio. Le Pautre also engraved a few plates after Paul Farinati, and he generally subscribed his engravings with his initials, either J. P. or J. le P.

Pierre le Pautre was the son of John, whom we have just mentioned, and was born at Paris A.D. 1659, and died in 1744. He learned the principles of design, and probably of engraving, from his father, but his execution was more neat, and he worked principally with the graver. He has also been spoken of as a sculptor with some approbation.

Pierre engraved several friezes; a figure of poetry for Perault's Cabinet des beaux Arts, published at Paris in 1690, and the pedestrian statue of Louis le Grand, which was erected in the Hotel de Ville in the year 1639; an engraving which is rare and highly esteemed, besides other works of inferior note.

Eustache le Sueur is not known to have etched more than a single plate, which is of the quarto size, and the subject "An Holy Family." He was a painter of great celebrity, and of whom the French are justly proud; while his firm and upright character merits the respect of all men. For a detailed account of his life as a painter, see Le Sueur.

François Chauveau was born at Paris in the year 1618, and died in the same city in 1676. He was the pupil of Laurent la Hyre, and painted small pieces in a very pleasing style; but he is better known by the vast number of his engravings. At the commencement of his career he employed the graver; but in a short time he substituted the etching-needle in its stead, by which means he was enabled to finish, with greater celerity, the prodigious number of subjects which his fertile and lively genius engendered: for as the demand for his works was very great, and especially by the booksellers, he was obliged to finish them with great expedition. If his execution is not always pleasing, we are at least delighted with the spirit, strength, truth, variety, and ingenuity of his compositions. In order justly to appreciate the merits of this artist, we ought not to form our decision from those plates which were chiefly executed by the graver. In them he appears cold and disagreeable, as may be seen in the prints of the Chartreux, which he engraved after le Sueur; whereas, in his etchings he is spirited and free.

Chauveau executed more than three thousand plates, many of which were after other masters, but the greater number from his own designs. It may suffice to mention the following, to some of which the name of Chauveau appears at length, and to others the cypher, which will be found in our plate.

Charles I. of England, in quarto. Jean Pierre Camus, bishop of Bellay, in quarto. "The Pleasures of Genius," in fifty figures, designed and engraven by Chauveau, in 1655, in quarto. "The principal Events of the Ancient History of Greece," on nineteen plates including the frontispiece, in quarto. "Ovid's Metamorphoses," by Benserade, with an explanation of each subject, in quarto. "Philosophical Fables of l'Esclaches," by Chauveau and Richer, eleven pieces. Twenty-one plates for the poem of Clovis, by Chauveau and Nicolas Cochin. Twelve plates illustrative of the poem of la Pucelle d'Orleans, by Chapelain; and two hundred and forty-two for the medals of Fulvio Orsini, 1663. Chauveau also executed several prints in conjunction with Berain, la Moine, la Pautre, and Sylvestre, for the collection of prints known under the title of the Cabinet of the King.

Subjoined are a few of the detached engravings of this artist, after his own designs, and those of different masters. "The Annunciation by the Angel," Chauveau inv. et fec. "A Repose during the Flight into Egypt." In this piece St. Joseph is represented offering a flower to the infant Jesus. "The Virgin Mary, her Son, the young St. John, and some Angels," inscribed Chauveau pinx. et sc. a small plate, but finely etched, and finished with taste. "The Crucifixion." In this piece the Virgin, St. John, and Mary Magdalen, are represented at the foot of the cross. Ib. inv. et sc. in folio. "The Mystery of the Holy Sacrament," 1678, on two plates. Two circular prints of "Meleager and Atalanta," and "Venus and Adonis," in folio. "Frontispiece to the Life of St. Bruno," in 4to. "Frontispiece for the Great St. Augustin," in 4to. "Frontispiece for the Poem of Charlemagne," in 4to. A "Thesis," with armorial bearings, and the four cardinal virtues. "Jesus Christ at Table with the Disciples at Emmaus," after Titian, in folio. This subject was also engraven by Masson. "A Concert," from Dominichino, in folio, a square. This subject was likewise engraved for the cabinet of the king, by Picart. "The Life of St. Bruno," from le Sueur's pictures in the monastery of the Chartreux at Paris. A series of twenty-two plates, in folio, engraved conjointly with le Clerc. "The Nativity of our Lord," after La Hire, in folio. "A Landscape, with the Holy Family," from La Hire. "Meleager presenting to Atalanta the Head of the wild Boar of Caledonia," after the same, in folio. "A triumphal Arch, a small upright, for the Place Dauphine," after le Brun. "Apollo and Daphne," from Poussin, a middling sized plate, dated 1667.

Nicolas Cochin was born at Troyes, in Champagne, in 1619, and died at Paris towards the end of the seventeenth century; he engraved a great number of prints, both of his own composition, and after other masters. He imitated Callot in the style of his engravings; but he was more successful in small figures than when he attempted to execute large ones. The following are deemed some of his best performances:

A series of subjects from the New Testament, eleven plates in 12mo. "The Martyrdom of the Apostles," a series of sixteen plates, in 12mo. A series of battles in the style of Callot, six plates in 12mo. A series of four plates, in which are represented the creation of the world; that of Adam and Eve; Adam eating the forbidden fruit, and Adam tilling the ground, in folio. "Melchisedech and Abraham," in folio. "Abraham sending away Hagar," in folio. "God promising the Land of Canaan," in folio. "The Children of Israel crossing the Red Sea," dated 1645, in folio. "Pharaoh drowned in the Red Sea," in folio. "Moses breaking the Tables of the Law," in folio. "The Adoration of the eastern Kings," in folio. "Repose in the Flight into Egypt," in folio. "Jesus preaching in the Desert," in folio. "Conversion of St. Paul," in folio "The Temptation of St. Anthony," in folio.

Besides the above, Cochin engraved several plates after Rembrandt, Callot, Della Bella, and other masters, some of which are contained in the works published by Beaulieu and Vulson.

Noel, or Natales Cochin, was likewise a native of Troyes, and supposed to have been the brother of Nicolas. After exercising his profession for some years at Paris, he retired to Venice, where he published several works.

It was this artist who engraved most of the plates for the work of Caroline Catherine Patin, daughter of the celebrated Charles Patin the physician, entitled, "Tabellæ selectæ

felectæ ac explicatæ a Carola Catherina Patina, Parifiana Academica;" he alfo engraved a holy family from Titian, St. Anthony miraculoufly reftoring a boy's foot, and a number of other coarfe etchings of little merit.

Charles le Brun, the great painter of the battles of Alexander, for the biography of whom, fee the article Le Brun, etched a few plates in a dark and bold, but mafterly ftyle; among which, befide the "Infant kneeling upon a Crofs," and "the four Parts of the Day," is a buft of St. Charles Boromeo, an oval in folio, after his brother Gabriel's defign.

Gabriel le Brun, the brother of Charles, was born at Paris in 1620. His talents were not of the moft brilliant kind, either as a painter or engraver. It has been affirmed, though we fhould hope without foundation, that fo jealous was he of the fame of his brother, as thrice to attempt his life by poifon. He engraved feveral pieces after Charles, as well as fome from other mafters, among which we fhall only mention the following.

Portrait of Charles Fevret de Saint Mefmin 1657, in folio, an oval. "An Allegory of the Peace concluded by Cardinal Mazarin," in folio. "Frontifpiece to the Memoirs of Vittorio Siri," in folio. The "Twelve Apoftles," after Charles le Brun, in folio. "The Redeemer," a large figure, from the fame, in folio, on two plates. "Saint Martin," after the fame, publifhed by P. Mariette, in folio. "Saint Antony," after the fame, in folio. A "Grand Thefe," dedicated to the parliament of Normandy; from the fame, in folio. Another "Grand Thefe," dedicated to the parliament of Britanny, from the fame. Gabriel alfo engraved feveral other pieces from Tintoret, Agoftino Caracci, and other Italian mafters.

Bourguignon the battle painter, (for whofe biography, fee Cortesi,) performed about this time a few etchings on copper, which are juftly admired and fought after by collectors of French art. They are in a ftyle of uncommon fire and freedom, and their chiaro-fcuros broad and mafterly. The fubjects of the principal of them are as follow:

A feries of eight plates of battles, fubfcribed Giac. Cortefe fecit, fmall. Another feries of four fmall plates of battles fubfcribed with his initials only.

The battles contained in the firft edition of the hiftory of the wars in Flanders, from Flam Strada, in 4to. are alfo attributed to this artift.

Guillaume Courtois, or Cortefi, the brother of Bourguignon, was born at St. Hippolito in Franche Compte in the year 1628, and died at Rome in 1679. He went to Italy at an early period of life, where he frequented the fchool of Pietro da Cortona, and fuch was his merit as a painter, that Carlo Maratte hefitated not to prefer his works to thofe of his mafter. His defigns may perhaps be more correct, but a certain coldnefs pervades his compofition. His engravings are few in number, and the following will probably be found to be the beft of them.

"The Plague, in which Tobias is feen burying the Dead," A. Wefterhout exc. in folio, nearly fquare. "A glorified Virgin Mary," in folio. "The Adoration of the Kings," infcribed Guil. Cortefe del. in folio. "The Prefentation of Chrift in the Temple," after Paul Veronefe, in folio. "The Refurrection of Lazarus;" after Tintoret, in folio. "Chrift healing the Sick," in folio.

The Courtois had another brother who was alfo named Guillaume, and who is faid to have been likewife a good painter. As he became however a capuchin friar in his youth, and only travelled refpecting the concerns of his order, very little is known concerning him.

Ifrael Silveftre was born at Nancy in the year 1621, and died in 1691 at Paris, where he had taken up his abode. The pupil and nephew of Ifrael Henriet, he difplayed fo much tafte and judgment in his views and other landfcapes, that Louis XIV. employed him to defign and engrave the royal palaces, as well as the public feftivals, and the principal places conquered by his arms. He afterwards was honoured with the title of mafter and defigner to the Dauphin, accompanied with the grant of a penfion and apartments in the Louvre.

Silveftre died in the month of October, at the age of feventy years, leaving behind a moft refpectable character and feveral children, of whom his fon Louis was afterward diftinguifhed by being invited to the court of Drefden, where he enjoyed the title of firft painter to Auguftus III. king of Poland and Elector of Saxony, and where he remained thirty years.

In the courfe of his life Silveftre twice vifited Italy, whence he brought back a great number of fketches and drawings, which he afterward engraved. The fmall figures with which he peopled his landfcapes are executed with tafte and fpirit. In the ftyle of his landfcapes themfelves, his French biographers fay, that he imitated Callot and Della Bella, and was in his turn imitated by le Clerc; but there is a certain freedom and felicitous feeling in the line of Silveftre, that has very rarely been equalled, and perhaps, as applied to certain objects, has never been excelled. His winding roads, his various buildings, his broken ground, &c. are moft taftefully delineated, without being pranked into the French picturefquenefs of the old fchool; and his freedom and felicity of outline, being its fureft teft, feems to proclaim *originality*. It fhould further be obferved, that the artift whofe originality of ftyle has merited and received the general approbation, deferves always to have that circumftance recorded to his honour, where it can be fo recorded with certainty. Now though it be true that Della Bella, Callot, and Perelle, were the contemporaries of Silveftre, yet the latter, (a fomewhat younger man indeed,) is known to have etched the grounds and buildings in fome of Callot's plates, which circumftance, efpecially when coupled with the internal evidence deducible from ftrong and fine feeling, affords a ftrong prefumption, that Silveftre was the firft French engraver who in his etchings delineated landfcape with tafte.

The whole number of engravings by this artift, amounting to more than a thoufand, we fhall here reftrict ourfelves to the mention of only the moft diftinguifhed.

A fet of four plates of the feafons perfonified. A fet of views in Italy and France, with French infcriptions, twenty-one plates. Views of different edifices in Rome, and the environs, publifhed by Ifrael Henriet, with explanations in French, thirteen plates including the title, in 8vo. Another fet of twelve views in Italy and France, with buildings and fmall figures. Another fet of views, ornamented in the fame manner, with explanations in Italian and French, twelve pieces in 8vo. Another fet of twelve under the title of "Alcune Vedute de Giardini et Fontane di Roma e di Tivoli, defignate et intagliate per Ifrael Silveftre," with explanations in Italian. Four views, three of Rome, and one of the village of Flovelle, near Nancy, in 8vo. Another fet of eleven plates, fome of which appear to be by Della Bella, of views in Italy, with explanations in the Italian language, in 4to. Another fet of eighteen topographical landfcapes, (views in France,) publifhed by Ifrael, and dedicated to Louis de Crévant, marquis of Humieres, in 4to. Another topographical fet of feven views in France, of the quarto fize, "taken on the feveral fpots by Ifrael Silveftre."

Silveftre." Views in the kingdom of Naples, with explanations in French, four pieces in 4to. in the form of friezes. Different landfcapes in the duchy of Burgundy, "taken on the feveral fpots by Ifrael Silveftre," with explanations in French, twelve pieces 4to. In the form of friezes. A fet of four plates of the environs of Nancy. A book containing views in France, Rome, and Florence, by Ifrael Silveftre, with explanations in French, twelve beautiful plates, in 4to. The fea-ports of Italy, on twelve quarto plates, in circles. Another fet on fix plates of fea-ports in Naples, and its environs, by Ifrael Silveftre, dated anno 1648, and alfo in circles. Views of the moft remarkable places in Paris, and the environs, taken by Ifrael Silveftre, with a dedication, and to each fubject an explanation contained in four French verfes, twelve plates in 4to. Several of this beautiful feries were engraven by Della Bella. Views of the principal edifices in Rome, and other parts of Italy, four of which are of Venice, twelve pieces in 4to. A beautiful fet. Another fet, with defcriptions in French, of Venetian topography, on twelve plates in 4to. Views of the caftle and other buildings of Fontainbleau, by Ifrael Silveftre, with explanations in French, ten plates, in 4to. Views of the chapel and houfe of the Sorbonne, founded by cardinal Richelieu; (the architect Jaques le Mercier,) together with feveral handfome chateaus in different parts of the kingdom, twelve plates in folio, with explanations. Views of the palace of Orleans, and of Luxembourg, with feveral other houfes and gardens in the environs of Paris, twelve pieces in 4to. Views in the environs of Paris, with explanations, twelve pieces, the frontifpiece to which is engraven by Claude Gayrand, in folio. This fet includes, by a ftrange affimilation, a view of the church of St. Sophia at Conftantinople. Another folio fet of eighteen views of monuments, &c. in Rome, and other Italian cities, accompanied with explanations in French and Italian. Another folio fet of feven plates, including the title, of Rome and its environs, taken by Ifrael Silveftre. The fubjects of this folio fet are the church of St. Peter; the garden of Montalto, the palace and garden of Ludovife, the bridge of Limentane near Rome, St. Agnes without the gates of Rome, and the arch of Conftantine. The churches named "the Stations of Rome," with a title and dedication on ten folio plates, comprehending views of the churches of St. Peter, St. Paul, St. Croix, St. John de Latren, Marie Magucre, St. Sebaftian, St. Lawrence, St. Marié del Popo'o, the Annonciade, and St. Paul of the three fountains, with Latin and French explanations. Topography of Nancy and its environs by Ifrael Silveftre, a native of that city, twelve pieces with explanations; the two laft of which views are engraven by Perelle, in folio. Perfpective views of the Cardinal palace, from the garden, the Louvre, and the Thuilleries, as well as of other celebrated places in the environs of Paris, by Ifrael Silveftre, with defcriptions in French, ten pieces in folio. A collection of views of chateaus and villas, drawn on the feveral fpots by Ifrael Silveftre, with defcriptions, ten folio plates. Another collection of views, on ten plates, dedicated to his majefty. Another collection of twelve folio perfpective views of chateaus and gardens, taken on the feveral fpots, and publifhed by Ifrael Silveftre, in 1651. View of the Mazarin palace, with the gardens and edifices on mount Quirinal, infcribed Ifrael Silveftre incidit, a large piece in folio. Perfpective view of the city of Rome, with an explanation of the principal edifices and fites dependent on it, very large, and engraved on four plates. View of Rome, with a part of the city in perfpective, and a fide view of the church of St. Peter. Silveftre fecit, excudit Parifiis, a large folio plate. Beneath which are twenty verfes by Scudery. Another perfpective view of Rome, with its edifices and ruins, a large folio, in the form of a frieze. Perfpective view of Paris, taken from the bridge of the Thuilleries, with references to the principal edifices, in folio. Two large perfpective views of Charité and Nevers, with infcriptions in Latin and French. De Lincler del Is, Silveftre fculp. long friezes. An excellent large, and very rare print, a view of the Colifeum at Rome, dated 1653. Perfpective views of Stenay, Sedan, Montmedi, Verdun, and Metz, a fet of five large folio plates. "The grand Caroufal," or royal entertainment given at Paris in the year 1662, confifting of an hundred and eight prints, in the execution of which Silveftre was affifted by F. Chauveau. "The Pleafures of the enchanted Ifland," dated in 1664, engraved on nine folio plates which were accompanied by a vignette, and publifhed at Paris.

Jaques Prou was born at Paris A.D. 1639, or thereabout. He ftudied under Seb. Bourdon and executed various etchings, fome of which were from the works of his mafter and other painters, and the reft from his own defigns. The following are a few of his beft pieces, all of which are of the folio fize. A fet of twelve landfcapes of his own compofition. A feries of fix grand landfcapes, of a wild and favage character, after Seb. Bourdon, large folio. "The Flight into Egypt;" after Aug. Caracci, and "St. John baptizing our Saviour in the River Jordan."

François Colignon was born at Nancy about the year 1621. He acquired the elements of engraving under Callot, whofe ftyle he adopted, ftudying alfo the works of Della Bella and Silveftre. In 1640, he vifited Rome, and, during his ftay in that metropolis, executed feveral pieces both from his own defigns, and after thofe of other mafters. On his return to France, he engraved, for the grand collection of Beaulieu, feveral views of the cities conquered during the reign of Louis XIV.

The following are from his own compofitions, a fet of twelve landfcapes, in folio. A feries of pieces entitled, "The witty Inventions of Love." "The Buildings of Rome under the Pontificate of Pope Sixtus Quintus." "A Plan of the City of Malta, with the ancient Fortifications."

From the defigns of other painters, he engraved, "The Flight of Attila," after the celebrated picture of Raphael in the Vatican. "The Canonization of the five Saints, St. Gaetan, St. Francis Borgia, St. Philippe Benizio, St. Bertrand, and St. Rofe," after J. B. Gaetano, in folio. "A View of Florence," drawn by Della Bella, in folio. "Plan of the Chateau de Moyen," formerly called Quinguengrogne, drawn by Callot, and a book containing nineteen prints in 4to. from the compofitions of L. Valerio.

Dominique Barriere was born at Marfeilles in the year 1622. He vifited Rome about the middle of the 17th century, and during his ftay in that city publifhed a great number of prints engraven in a ftyle, having fome refemblance to that of Della Bella. He either infcribed his works with his name in the following manner, Dominicus Barriere Maffilienfis, or with his cypher, which will be found among our monograms of the French fchool. Among others, the following pieces are from the hand of this mafter:

Portrait of John de la Valette, grand Mafter of Malta, in profile, marked D. B. in folio. This is a very fcarce piece. A fet of fix landfcapes, Roffi ex cudit, in folio. A fet of 12 landfcapes, dedicated to Lelio Orfini, and dated 1651, in folio. Series of feven views of the villa of Aldobrandini, engraved in 1649, and infcribed Dominicus Barriere Maffilienfis, in folio. Landfcape, in which is feen the zodiac, with this infcription: "Vim profert ubi maxi-

nam,

ſinam, in folio. View of Freſcati, and its environs, in folio. "Pontana magiore nel Giardino di Tivoli, Vicino al organo," in folio, with the cypher of the engraver. "Statue e Vedute della villa Pamfili." Roſſi exc. in thirty-four middle ſized pieces. "Catafalco e aparato nella chieſa di S. Vincenzo e Anaſtaſio, pen. Eſſequie del cardinal Mazarino," four pieces in folio. "Sepulchral Monument of Nicolao Ludoviſi Plumbini, la Collegio ſac. Jeſu. Dominicus Barriere Gallus inventor, exegit, delineavit et ſculpſit," in folio. "Hercules ſitting, from a bas relief, in the Garden of the Palace of de Medicis," inſerted in the book of the Heſperides of P. Ferrari, in folio. "Circum Urbis Agonalibus ludis olim celebrem, dicata triumphali pompo Chriſto reſurgenti Hiſpana pietas celebriorem rediddit." Anno Jubilei 1650. Eques Rainal Archit. Dominicus Barriere maſſ. del. et ſc. This, ſay the French writers, is a ſuperb piece, enriched with a vaſt number of figures. "The Hiſtory of Apollo," engraved on ſeveral plates, after the paintings of Dominichino and Viola, in the Villa Aldobrandini.

Beſides the above, Barriere executed various other works, after Cortona, Bologneſe, Claude of Lorrain, Titian and other maſters.

Gabriel Perelle deſigned and engraved landſcape with conſiderable ſucceſs. He was a native of Paris, born ſome time about the year 1622; and, in conjunction with his ſons Adam and Nicholas, produced a very great number of plates, ſome of which are views, but the far greater part engraved from his own original compoſitions.—In point of drawing, his prints are far above mediocrity; but his chiaro-ſcuro wants breadth, his lights are too much ſcattered; and he ſeems to have endeavoured to compenſate for this want of breadth by the depth of his ſhadows, which has rendered his effects ſpotty; and in conſequence of his employing the point too little, and the graver too much, the ſtyle of his engraving is ſomewhat heavy and dry.

But notwithſtanding theſe defects, Perelle was a meritorious artiſt, and ſhould be ranked high among the landſcape engravers of France; though the foliage of his trees be defective in natural expreſſion, the ruined temples and other edifices which abound in his works are almoſt always taſteful and pictureſque. His imagination, ſtored by contemplating the works of Claude, the Pouſſins, Dominichino, and his great predeceſſors in landſcape, was lively and productive; he underſtood much of the principles of compoſition, and in conſequence, often attains elegance, and ſometimes conſiderable grandeur.

The engravings by this family, of whom the father appears to have been the ſuperior artiſt, are generally inſcribed "Perelle inv. et fecit." The whole have probably never been enumerated, but ſeven hundred and ſixty of their prints are known to have been in the poſſeſſion of the abbé Marolles in the year 1666, whilſt the artiſts were yet living. Of theſe a large proportion are from the compoſitions of the ſenior Perelle, and were publiſhed in ſets, generally conſiſting of four each, of the quarto ſize, and circular form, but without any titles beneath. As it would be endleſs to deſcribe theſe, we can only ſay in general that there are at leaſt a dozen of theſe ſets, conſiſting chiefly of mountain ſcenery with rocks, ruins, trees, and figures. Ruined edifices ſeen by moon-light conſtitute the ſubjects of one ſet; and at leaſt two ſets are of ſhipping and ſea ports. Of the remainder of Perelle's works, the following will probably be found moſt worthy of notice.

Four views in the gardens of Verſailles. A pair of do. The grotto of Rouel and the fountain of Tivoli, in folio. Five ſeveral pairs of folio landſcapes with appropriate figures. A pair of views, one of the gate of conference, the other in the gardens of St. Cloud, then the palace of the archbiſhop of Paris, in folio. A pair of views in the gardens at Fontainbleau. A ſet of four, alſo of the folio ſize, and from drawings by Silveſtre, *viz.* The church of St. Michael of Dijon; the palace of Dijon; the bridge of Grenoble, and the Point Reale of Marſeilles. Four views in Paris: *viz.* The arſenal and the mall, the Pont Neuf and the Ile du Palois; the Louvre, and the gate of Neſle; and the Mall with the adjoining fields. Silveſtre del. Perelle ſc. in folio. Four provincial views, namely, the baths of Bourbon d'Archambaut; the holy chapel of Bourbon d'Archambaut; the chateau of Bourbon Lancy, and its baths in the time of Julius Cæſar; and the Grand Chartreuſe near Grenoble; drawn by Silveſtre, in folio. Six views of the moſt beautiful ſcenes in the garden of Ruel. Iſrael Silveſtre del. Perelles ſculp., in large 4to. Two mountainous landſcapes, with buildings and ruins, in the one Abraham is repreſented diſmiſſing Hagar, and in the other the good Samaritan, from P. Bril, in folio. "The Adoration of the eaſtern Kings," the figures ſmall and ſurrounded by ruins, after C. Poelenburg, in folio. "The Defeat of the Spaniſh Cats by the French Rats," a ſatirical print, engraved on the occaſion of the ſurrender of Arras in 1642, with ſix explanatory verſes. L. Richer, inv. G. Perelle ſc. This piece, which is extremely ſcarce, was ſuggeſted by the following circumſtance. During the ſiege, the inhabitants of Arras affixed the following inſcription upon one of the gates: "Quand les François prendront Arras, les Souris mangeront les Chats." (When the French ſhall take Arras, the Mice will eat the Cats.) After the fall of the city, the inſcription was altered by the Frenchmen obliterating the p.

Jean Couvay was born at Arles A.D. 1622, and enjoyed the reputation of being one of the beſt French engravers of the ſecond claſs. His ſtyle poſſeſſed much eaſe, and reſembles that of Villamena. He executed both portraits and hiſtorical ſubjects, after his own deſigns, as well as from thoſe of other artiſts; and moſt of his prints are marked with his cypher, which will be found among our monograms of the engravers of the French ſchool. The following are a few of his beſt productions.

"The Virgin Mary preſenting ſome Pinks to her Son, whom ſhe holds on her Knees," after Raphael, inſcribed "Dilectus meus mihi et ego illi," in folio. "John the Baptiſt in the Deſert," after the ſame, in folio. "St. Benedict tempted by the Demon of the Fleſh, whom he puts to flight by preſenting a Crucifix." A night piece, after Guercino, in folio. "A Madonna," after Blanchard, in folio. A half-figure of an "Afflicted Magdalen, deſpoiling herſelf of her Raiment," after Le Brun, in folio. "The Aſcenſion," in which the portrait of the painter is ſeen among the apoſtles, after Jac. Stella, in folio. "Cleobulus, one of the ſeven wiſe Men of Greece," after Cl. Vignon, in folio. "The Martyrdom of St. Bartholomew," after Pouſſin, in folio, one of the beſt engravings of Couvay. A pair after G. Huret, which are entitled "The Reſidence of the Faculties of the Soul," and "The beautiful Abode of the five Senſes," in folio, engraved in imitation of the ſtyle of Ab. Boſſe.

Among the portraits of Couvay, the moſt eſteemed are, An effigy of brother Simon Diſſy, a lay capuchin, and Louis XIV. on horſe-back, preceded by Fame, after J. Bourdon, in 4to. the frontiſpiece to the poem of Clovis.

Sebaſtien Vouillement was born at Bar-ſur-Aube about the year 1622. He acquired the elements of deſign under Daniel Rabel, and engraved ſeveral plates both at Paris and Rome, where he reſided for a conſiderable time, but they

poffefs very little merit. He frequently ufed the cypher which is given in our plate of French monograms. The following are a few of the works of this artift :

"A Gypfey fore-telling good Fortune to a Youth," infcribed with twelve French verfes, in folio. This is better than moft other of the engravings of Vouillement. "Pope Urban VIII. pronouncing the Benediction," infcribed S. Vouillement fc. Romæ 1642, in 4to. "An Author writing," from Pouffin, for the Documenti d'Amore, with the cypher of the engraver, in 4to. After Raphael he has engraved, in folio, "The Maffacre of the Innocents," from two different compofitions. "Mount Parnaffus," from the picture in the Vatican, and "An Holy Family." "The betrothing of St. Catherine," with "St. Jofeph" and "St. Cecilia," are all from Albano, and in folio.

Jean Pefne (called Penna by the Italians) was born at Rouen in the year 1623, and died at Paris in 1700. It does not appear under whom he ftudied, and Strutt, with great probability, conjectures that he was brought up under fome painter, perhaps Nicholas Pouffin, from whofe pictures the greater part of his engravings are taken. He etched in a flight, coarfe, and irregular ftyle, and finifhed his plates with the graver, harmonizing and blending his work by means of ftippling. Watelet fays of him, fomewhat feverely, that "his ftyle of execution is neither agreeable, fcientific, nor picturefque ;" but the fuperior merit of fidelity to the effect of his original belonged certainly to Pefne ; notwithftanding the drynefs and roughnefs of his ftyle, his maffes of light and fhade are broad and clear ; yet he did not detail his forms with fufficient accuracy, and it has been juftly afferted of him by Strutt, that had "the heads and other extremities of his figures been more carefully attended to, it might have been faid that the fpirit of that admirable painter (Pouffin) was never better expreffed than by this artift ;" but an exception very properly follows, in favour of Gerard Audran, and probably another ought to have followed in favour of Claudia Stella.

The beft of his engravings are, two portraits of N. Pouffin, from pictures by himfelf, middle-fized upright folios, one dated in 1649. From the fame mafter, and of the folio fize, are "Efther, before Ahafuerus," in folio. "The Nativity, or Adoration of the Shepherds." "The Body of Chrift extended near the Sepulchre, with Mary and St. John weeping." "Chrift laid in the Sepulchre." "The Death of Sapphira." "A Madonna, with the Infant Chrift, and the little St. John." "A Holy Family," dedicated to C. le Brun. "St. Paul taken up into the third Heaven." "The Teftament of Eudamidas of the City of Corinth." "The Triumph of Galatea." "Summer, with the Story of Boaz and Ruth." "Autumn," the figures introduced into which are the two fpies bearing a bunch of grapes from the promifed land. N.B. The two other feafons, which compleat the fet, are engraven by J. Audran. A fet of nineteen plates, including the frontifpiece of the Labours of Hercules, from the paintings of Pouffin, in the grand gallery of the Louvre. The manner in which the engraver has conducted his lines in thefe engravings is highly commended by Huber and Roft. "The Seven Sacraments," from paintings formerly in the Palais Royal, and now in the collection of the moft noble the marquis of Stafford, at Cleveland houfe, namely, "The Baptifm," or John baptizing Jefus in the waters of Jordan ; "The Supper," or Jefus at table in the houfe of Simon the Pharifee, with Mary Magdalen at his feet ; "The Confirmation," given by the high prieft ; "The Euchariſt," or Jefus holding the Paffover with his Difciples ; "Extreme-Unction" adminiftered to a dying man, furrounded by his weeping Family ; "The Charge," or Jefus delivering the keys to St. Peter ; and "Marriage," or the affiancing of Jofeph and Mary, large folio plates.

The following pieces are after other painters of the Italian fchool "A Holy Family," from Raphael's celebrated picture in the Orlean collection, in folio. In this piece Mary is reprefented holding the Infant Chrift, whom St. John embraces, while St. Jofeph is feen at a little diftance walking behind a thicket. A feries of landfcapes, with a frontifpiece, by Jean Pefne, named here (at Rome) Gio. Penna, in fifteen plates, in folio, a production highly valued by connoiffeurs.

Among his portraits, the two following are moft efteemed, Louis le Comte, fculptor to the king, (infcribed J. Penne pinx. et fculpfit,) in folio, and Francis Langlois, called de Chartres, bookfeller, after Van Dyke, dated 1645, and alfo of the folio fize.

Francois de Poilly was born at Abbeville A.D. 1622, and died at Paris in 1693. De Poilly was the fon of a goldfmith, and the goldfmiths of the feventeenth century exercifing alfo, in the ornamental parts of their work, confiderable ingenuity in the arts of engraving and defign, he acquired the rudiments of his future profeffion under his paternal roof. He was afterward fent to Paris, and placed under the tuition of P. Daret, (who had been the pupil of Bloemart,) with whom he remained three years ; but being ftill defirous of acquiring more extenfive profeffional knowledge, he went to Italy, and refided feven years in the city of Rome, where he engraved feveral very capital fubjects, from the great painters of that time, and their ftill greater predeceffors.

De Poilly worked with the graver only, and may juftly be fpoken of as one of the moft fkilful artifts in the management of that inftrument, that France ever produced, at leaft till Europe was furprized by the tranfcendent manual powers of Wille and Bervic. His engravings are bold, firm, and clear, and are finifhed with great accuracy ; but from want of variety in the handling of his graver, the flefh, draperies, and back grounds of his figures are not fufficiently diftinguifhed from each other, and hence his works have much of the heavinefs and coldnefs of a leaden ftatue. Rectangular croffing was the prime element of his ftyle ; powerful fecond courfes of lines were thrown over his firft courfes, fo as to form a fmall fquare between the interfections of every four lines. His outline however is drawn with great care and precifion ; in the characters of his heads he faithfully copied his originals, and his extremities, in general, are well rendered.

On his return from Italy de Poilly fettled in Paris, where he not only purfued his profeffional labours with his wonted affiduity, but likewife inftructed a great number of pupils, both foreigners and of his own country ; notwithftanding whofe affiftance, it is not eafily conceivable how he produced the very great number of plates which bear his name, when we reflect that many of them are large, and all the refult of confiderable care and patience. His engravings confift of hiftorical fubjects and portraits, of which we fhall proceed to mention fome few of the moft remarkable, beginning with the latter.

Louis XIV. when a youth, after J. Nocret ; Henry d'Arnaud, bifhop of Angiers ; Jerome Bignon, counfellor of ftate, after Philip Champagne, dated 1664 ; Abraham Tabert, marefchal of France, after L. Ferdinand ; Cardinal Mazarin, after P. Mignard ; Guillaume de Lamoignon, furrounded by allegorical figures of Virtue, Probity, and Candour, from the fame painter ; and a buft of the fame original, as large as life. The above are all of the folio fize, and there

there is a portrait of de Poilly himfelf, engraven by his pupil J. L. Rouillet in the year 1699, from a drawing by his mafter, done in the year 1680, and infcribed Francois de Poilly, engraver to the king.

The following hiftorical works are alfo of the folio fize :

"The Holy Family," in a landfcape of a circular form, in which St. John is embracing the Infant Jefus. "St. Ignatius de Loyola on his Knees." "St. Francis Xavier dying among the Indians." "The grand Triumph of Auguftus." "The Vifion of Ezekiel," from a picture of Raphael, in the gallery of the Palais Royal. "A Holy Family," after Raphael, in which the Infant Chrift is reprefented ftanding on his cradle, an upright. "The Madonna raifing a Veil to fhew the fleeping Saviour to St. John," from the fame mafter, and of the upright form. (N.B. The firft impreffions of this plate are before the crofs lines were engraved on the veil.) The print is known among foreign connoiffeurs by the appellation of "La Vierge au linge." "The Nativity," a large upright, in an octagonal border, from Guido, one of the beft of de Poilly's engravings. The early impreffions, which are now become fcarce, were taken before the fmall angels, which in the later impreffions appear above, were inferted. "The Flight into Egypt," from the fame painter, in which Guido has introduced the poetic idea of an angel ftrewing with flowers the path of the holy travellers. "Jefus Chrift at Prayers on the Mount of Olives," from the fame. "A dead Chrift," from a capital picture of Caracci. "Chrift bearing his Crofs," from the fame. "Nymphs bathing, in a Landfcape," after Julio Romano. "The overflowing of the Nile," after a defign by Algarde. Views of two fides of the grand obelifk of the emperor Caracalla, erected at the fountain of Bernin, in the Place de Navonne, a pair of large uprights. "A Holy Family," after a picture of Pouffin, in the Houghton gallery. "The Marriage of St. Catherine," after P. Mignard, a large upright. "The Baptifm of Jefus Chrift," infcribed "Hic eft filius," after the fame, a large upright. "St. Charles Boroméo adminiftering the Sacrament to thofe ill of the Plague at Milan," from the fame. A capital piece both in refpect to painting and engraving. "Mercury receiving the Order from Jupiter to convey the Infant Bacchus to the Nymphs," from Alexandre. "The Vifitation," from C. le Brun. "St. John in the Ifle of Patmos," from the fame. "The Crucifixión," a large upright, from the fame. "The Defcent from the Crofs," after the fame. "Grand Thefé of the abbé Tellier," in which Time holds up the portrait of Louis XIV., after the fame, two plates, ovals. "Grand Thefé of Duke Albert, in which Louis XIV. clothed in a royal Mantle, appears feated, and fupporting himfelf upon his Truncheon," dated 1663, in two plates. "Grand Thefé of M. de Segnelai, in which Louis XIV. clothed in a Roman Habit, is accompanied by Minerva and Power," after the fame, in two plates. Grand Thefé, the fubject of which is "The Difpute between Minerva and Neptune, refpecting the Name to be given to the City of Athens," after le Brun. "The Parable of the Gueft, without a wedding Garment," after Ph. Champagne. "A grand Crucifixion," where the Saviour is on the point of expiring, ufually termed "Le Chrift des Chartreux," from the fame, in three plates. "The Afcenfion," after the fame. "Jofeph's bloody Coat prefented to Jacob," after Ant. Coypel.

Nicolas de Poilly, the brother, and in fome fort the pupil of the former, was alfo born at Abbeville in the year 1626, and died at Paris in 1696. He was an excellent defigner and engraver, though fomewhat inferior to his elder brother, whofe ftyle of engraving he fuccefsfully imitated. He engraved a great number of portraits, as well as hiftorical fubjects, which are very much valued by connoiffeurs for the neatnefs and precifion of their execution. The following are a few of the fubjects, which he engraved after different mafters :

"A Head of the Virgin Mary," without the painter's name, which is however Champagne. "St. Auguftin holding a Crucifix," from the fame, an upright folio. "A Holy Family," in which two angels are feen fupporting a bafket of flowers ; from S. Bourdon, in folio. "The Nuptials of St. Catherine," from the fame painter. "The Prefentation in the Temple," from le Brun, in 4to. "The Return of the Holy Family from Egypt," after the fame, in 4to. "The Holy Family, with the Virgin having the Infant Jefus afleep on her Lap," from the fame ; a celebrated piece, known under the name of the *Silence*, in folio. "Repofe during the Flight into Egypt," Chaprin pinx. in folio. "Chrift on the Crofs between the two Thieves," from Pouffin. Note, This fubject is engraved in a much fuperior ftyle by Claudine Stella.

Among his beft portraits are thofe of Louis XIV. in a frame ornamented with laurels, an oval, furrounded by angels bearing emblems, after N. Mignard of Avignon. Louis XIV. dated 1683, the head of the natural fize. Maria Therefa, queen of France, 1680, of the fame form and dimenfions. Louis, dauphin of France, fon of Louis XIV. of the fame fize. Marie Anne Victoire de Baviere, dauphinefs of France, of the fame fize. Louis de Bourbon, ftyled the Great Condé, of the fame fize. Pierre du Cambout de Coiflin, grand almoner of France, bifhop of Orleans, of the fame fize. Francis de Borgia, a Jefuit. Francis de Coetlogen, bifhop of Rennes. René Potier, duke of Gefvre, peer of France ; after Cl. le Fevre. Nicholas Edward Olier, counfellor to the king, after the fame. Noel de Bullien, marquis of Gallarden, regiftrer to the king ; thefe are all of the folio dimenfions.

Jean Baptifte de Poilly, the fon of Nicolas and nephew of Francis, was born at Paris in 1669, and died in the fame city in 1728. After having acquired the elements of defign and engraving, he vifited Rome, with the view of improving his knowledge of thefe arts. On his return to his native country, he diftinguifhed himfelf by feveral works of merit, in confequence of which he was admitted a member of the Royal Academy. His ftyle of engraving did not much refemble that of his father and uncle ; he advanced his plates confiderably in the etching, and further improved upon the manner of his inftructors by mingling ftippling with his courfes of lines. By this method he produced a very picturefque effect, both in his portraits and hiftorical fubjects ; and acquired great honour in his own country, by engraving Mignard's gallery of St. Cloud.

Among other fubjects, the following were engraved by him, after different mafters :

"The Nativity of Chrift," after Gaudentio Ferrari. "Danae in a golden Shower," from a cartoon of Julio Romano, in the cabinet of the duke of Orleans, in folio. "The Virgin worfhipping the Infant Chrift," after Benvenuto Garofalo, in folio. Note, The three latter are in the Crozat collection. "The Martyrdom of St. Cecilia," after Dominichino, an upright folio, intended as companion to the "Alms of St. Cecilia," engraved by Francis de Poilly (his brother) after the fame painter. "The Nativity," after the picture of Carlo Maratti, in the cabinet of the king ; a beautiful piece, in folio, almoft fquare. "Aaron's Rod, changed into a Serpent, devouring thofe of the Magicians ;" after Pouffin, in folio. "The Adoration of the Golden Calf," from the fame, in folio. "The Holy Family," infcribed "Sacra Chrifti Familia ;" after the fame,

fame, from the cabinet of the king, in folio. The grand faloon at St. Cloud, (by Mignard) namely, "The Banquet of the Gods;" "The Workfhop of Vulcan;" "The God Pan, accompanied by Bacchantes and Fauns," and "Mars and Venus accompanied by the Loves and Graces;" befide which, belonging to the fet, are eight plates of Caryatides, richly ornamented. "Faith and Hope," two emblematical pieces, after the fame, in folio. The four feafons, painted in the gallery of St. Cloud, after the fame. "Spring, the Nuptials of Flora and Zephyrus." "Summer, Sacrifice in Honour of Ceres." "Autumn, the Triumph of Bacchus and Ariadne." "Winter, Cybele imploring the Return of Sol," in folio. A ftatue of Truth, after Bernini, in folio. "The Judgment of Solomon," after Antoine Coypel, in folio. "Sufanna accufed by the Elders," after the fame. A pair, "Neptune armed with his Trident, and ftanding on a Dolphin," and "Jupiter grafping Thunder, and feated on a Cloud," infcribed Fr. Verdier inv. J. de Poilly fc. in folio.

His beft portraits are thofe of Corneille van Cleve, fculptor, painted by Vivien. Francis de Troy, painter; from a picture by himfelf. Clement XIII. Pontifex max. Prince Charles Edward Stuart, a whole length figure on foot, after Dupra. Louis XIV, after Mignard. They are all of the folio fize.

Nicolas Loir, the fon of a goldfmith, was born at Paris in 1624, and died in the fame city in 1679. He frequented the fchools of S. Bourdon, le Sueur, and le Brun; and in his youth went to Rome, where he fuccefsfully ftudied and imitated the works of Pouffin. On his return to Paris, he foon became diftinguifhed by the merit of his productions. He painted many pieces for the palace of the Thuilleries, and the chateau of Verfailles; and fo delighted was the king with his works, that he conferred on him a penfion of four thoufand livres. Strutt fays that he beftowed too little attention in revifing his firft thoughts: yet his compofitions are not without intelligence; and his figures, efpecially thofe of his women and children, poffefs a certain degree of delicacy and expreffion. He was early admitted a member of the royal academy, and at the time of his death held the fituation of rector.

Loir engraved, with confiderable freedom and fome tafte, about a hundred and fifty pieces of different forms, fome of which are much more finifhed than the generality of painters' etchings. Of thefe the following are efteemed the moft valuable:

A feries of twelve plates illuftrative of the hiftory of the holy family, in fmall quarto, and of the upright form. "A Madonna clafping the Infant Saviour." "A Madonna fitting, with the Infant on her Knees." "A Madonna, with the Infant afleep," infcribed "Ego dormio." "A Madonna, with the Infant holding a Crofs in his Hand." "A recumbent Chrift, embracing the Crofs and Crown of Thorns, with his Eyes turned towards Heaven." "The Judgment of Paris." "Daphne changed into a Laurel." "The filial Piety of Cleobis and Biton," who drew the chariot of their mother Argia to the temple of Juno, of which fhe was a prieftefs; the above are all in folio, and the laft is efteemed to be, on the whole, the beft of Loir's performances. Two large landfcapes, lengthways.

Alexis Loir, the younger brother of Nicholas, was born at Paris in 1640, and died in the fame city in 1713. Young Loir was an excellent defigner and engraver, though partly educated a goldfmith; his manner was eafy, vigorous, and expreffive, and he knew how, to a certain degree, to vary his ftyle according to the mafters after whom he engraved. He executed feveral etchings, but his croffed hatchings were too fquare, and his lights too much and too equally covered for this fpecies of engraving. We add a lift of the beft of the works of this artift, which are in general of large dimenfions.

"The Education of Mary de Medicis;" after one of the paintings of Rubens in the gallery of the Luxembourg, in folio. "Time difcovering Truth, and treading Herefy under Foot," from the fame mafter, in folio. "The different Nations of Europe;" after Ch. le Brun, in folio. "The Fall of the rebellious Angels," after the fame; large and engraved on two plates. "The Maffacre of the Innocents," after the fame, and alfo engraved from a motive of convenience to the engraver, on two plates. "A weeping Madonna, with the dead Chrift on her Knees," after P. Mignard, in folio, a large upright, arched at the top. "The Finding of Mofes," after Pouffin. "Venus prefenting Arms to Æneas," after the fame, in folio. "The Adoration of the Kings," after Jouvenot, in folio. "The Prefentation in the Temple," after the fame, in folio. "A dead Chrift furrounded by many Figures, at the Foot of the Crofs," after the fame, in folio. "A Madonna with a fleeping Chrift," after Nic. Loir, in folio. "A Holy Family," in which the infant Jefus is fitting on a crofs, after the fame, in folio, and of the circular form. "A Holy Family," comprifing four figures, after the fame, in folio. "A Magdalen at Prayers," after the fame; a capital piece.

Nicholas Regneffon was born at Rheims about the year 1625, and died at Paris in 1676. He was the brother-in-law, and according to fome French writers, the inftructor, of the celebrated Nanteuil, but he was only five years older, and Strutt with more probability afferts that he learned from Nanteuil the art of engraving. Their ftyles bear confiderable refemblance, but the argument which may be derived from the evident vigour of original feeling, is entirely in favour of Nanteuil.

The engravings of Regneffon are however juftly held in efteem. They confift partly of frontifpieces, and other book-plates, from his own defigns, but chiefly of portraits on a larger fcale, and alfo from drawings by himfelf, which were performed in crayons, of which the following will be found moft worthy of notice:

Anthony Fremin, fecretary to the queen-mother. Cardinal Julius de Mazarin in an octagonal frame of oak-leaves, dated 1656. A young magiftrate, dated 1661, all in folio. Francis de Vendofme, duke of Beaufort, grand admiral of France, after Carelle, in folio; and the princefs of Conti, a buft after Beaubrunn, in quarto.

Of his hiftorical works, thofe of moft importance are,

"The Marriage of St. Catherine," round, bordered with oak-leaves, infcribed Nic. Regneffon fec. in folio. "The Holy Family," by Regneffon and Nanteuil, in folio. "A Madonna, with her Eyes raifed," after Le Brun, in folio. "A Buft of the Infant Saviour," after the fame, without the name of the engraver, but which is known to be from the graver of Regneffon, in folio. "The Defcent of the Holy Ghoft," after a painting in the cathedral of Notre Dame, from Blanchard, in folio. "A Holy Family," furrounded by a border of rofes and lilies, after N. Coypel, in folio. "A Madonna with the Infant Jefus and the little St. John," after F. Bourdon, in folio.

Stephen Gantrel was born at Paris in 1626, but the year of his death is not recorded. He publifhed feveral prints, of which the fubjects are hiftorical, as alfo a great number of portraits, engraved by himfelf in a tolerably good ftyle.

We

We begin our liſt with his hiſtorical works, which are chiefly of the folio ſize.

"The Rod of Moſes changed into a Serpent devouring thoſe of Pharoah's Magicians," after Pouſſin. "The Paſſage of the Red Sea." "The Worſhip of the Golden Calf." "The Deſcent from the Croſs." "St. Francis Xavier reſtoring an Indian to Life;" all after the ſame maſter, and in folio. "St. Gervaiſe, and St. Protais, before the Proconſul," after Le Sueur, a diſtinguiſhed piece. "St. Benedict kneeling," after Ph. de Champagne. "St. Francis in a Trance, upheld by Angels," after Caracci; and a "Buſt of the Saviour," from Le Brun; theſe are alſo in folio, as are the following portraits:

Sebaſtian Piſani, biſhop of Verona, inſcribed Steph. Gantrell fc. Antoine Bruneau, counſellor-preſident of Tournelle, La Dam pinx. Jean Louis de la Bourdonnaye, count-biſhop of Lyons, Eligius Fontaine pinx. Mathew Poncet de la Riviere, maſter of requeſts, inſcribed Stef. Gantrel fc. 1681. Louis Berryer, firſt counſellor to the king, almoſt as large as life, dated 1674. Louis XIV., king of France, the head as large as life, and inſcribed Stef. Gantrel fec.

Of the family of the Coypels, and their characters as artiſts, we have already given an account. (See COYPEL.) Noel, the elder, etched a Madonna careſſed by the infant Chriſt, dated 1664; another plate of the ſame ſubject, larger, and "The Holy Family," including St. Joſeph and St. John. But Antony produced a more conſiderable number, which have obtained from Strutt more praiſe than they will probably be found to deſerve. They are however ſought after by ſome connoiſſeurs, and the beſt of them are entitled as follows:

Two portraits of Le Voiſin, who was burnt in the Place de Greve, one large, the other ſmall. A buſt of Democritus, inſcribed A. Coypel pinxit incidit et excudit 1691, in quarto. "The Meeting of Abraham and Melchiſedec," a medallion. "Judith," the plate of which was finiſhed by C. Simoneau, a ſmall upright. "The Baptiſm of Chriſt," inſcribed A. Coypel pinx. et fecit. "An Ecce Homo," alſo finiſhed by C. Simoneau, a ſmall upright. "Chriſt in his Winding Sheet." "A Madonna and Child," an oval. "A Madonna ſuckling the Infant." "A Magdalen periſhing in the Deſert," anonymous. "A St. Cecilia," inſcribed "Cantabo Domino in vita mea." "An Allegory," illuſtrative of the fame of the Dauphin, or the ſycophancy of the times. "The Infant Jupiter confided to the Nymphs." "Cupid conquering Pan," dated 1691, inſcribed A. C. "Bacchus and Ariadne," a large and excellent plate finiſhed by Audran; and "The Triumph of Galatea," another large plate, finiſhed by C. Simoneau.

The etchings of Noel Nicholas Coypel, of which the ſubjects follow, are ſomewhat inferior to thoſe of his elder brother Anthony.

"St. Thereſa ſurrounded by numerous Angels," an oval in quarto. "The Triumph of Amphitrite," in quarto. "A ſleeping Nymph ſurpriſed by a Satyr," in quarto. "A young Woman careſſing a Dove," the plate of which was afterwards finiſhed with the graver by N. Edelinck.

The ſtyle of Charles Antoine Coypel was by far too much made up of the affectation and inſipidity of the old French ſchool, for him to have merited the praiſes which are beſtowed on him by Strutt. Though he had the advantage of being inſtructed by his father Anthony, and of inheriting his court patronage, he laboured both in the arts and belles lettres to little purpoſe. Yet the following engravings by this artiſt cannot properly be omitted in collections of the productions of the French ſchool, *viz.*: Portraits of M. de Maroulles, duke of St. Paul, and François Potet, ovals, in quarto. Portrait of the painter Cigoli, in chiaro-ſcuro. "The Madonna worſhipping the Infant Jeſus while aſleep in his Cradle," an anonymous engraving, in imitation of the ſtyle of Guido. "A Crucifix embraced by Mary Magdalen." Two heads, of which one is the St. Paul from the cartoon of Raphael. A ſtanding figure of Cupid, in folio, one of the beſt of this artiſt's productions, and certainly a work of merit. "Apollo with his Lyre," after Michael Angelo, in folio. "A Shepherd converſing with two Shepherdeſſes." "Two young Girls predicting the Fortune of a Lord." A ſet of three plates of the delights of a French devotee. In the firſt ſhe is repreſented on her knees, in the ſecond returning from church, with her prayer book, and in the third ſcolding her waiting woman. Charles alſo engraved ſome other comic and farcical ſubjects, conſiſting of old maids, cats, coquettes, petit maitres, &c. and, in conjunction with count Caylus, he etched a deſign for a tomb, and ſix or eight caricatures of opera figurantes.

Antoine Bouſonnet Stella, the nephew of Jacques, whom we have already mentioned, was born at Lyons in the year 1630, and died in the ſame city in 1682. He acquired the rudimental principles of his art under his uncle, whoſe ſtyle he ſucceſsfully imitated. While he remained in his native city he executed ſeveral good pictures, and on afterwards repairing to Paris, he acquired ſo much celebrity by his talents, that he was received into the Royal Academy.

The following, among other pieces, were engraven by this artiſt:

"A Landſcape," on one ſide of which is repreſented Tiber with his urn, and the ſhe-wolf that nurſed Remus and Romulus; on the oppoſite ſide appears another river god, and in the middle a view of the city of Rome; a ſmall piece in folio, dated 1654. "Moſes defending the Daughters of Jethro," after Pouſſin, inſcribed Bonnart excud. This appears without the name of the engraver, but Huber aſcribes it to the artiſt now under notice.

Claudine Bouſonnet Stella was born at Lyons A. D. 1634, and died at Paris in 1697. She acquired the elements of painting from her uncle Jaques Stella, but ſhe attached herſelf in preference to engraving, which ſhe executed in a very ſuperior ſtyle.

Strutt ſays of the prints by Claudine, that they "prove the ſtrength of her genius, and the ſoundneſs of her judgment:" that the naked parts of her human figures are exceedingly well drawn, and the characters of her heads finely expreſſed; and Watelet proceeds ſtill further in her praiſe: he ſays, "it muſt be admitted that no one ſeized with ſo much accuracy the true art of Pouſſin; no one has ſucceeded ſo well in indicating the colouring of this maſter, and, in ſhort, on viewing the prints of Claudine, we behold in this reſpect a complete repreſentation of the pictures. She far ſurpaſſed Peſne, and even improved upon Gerard Audran." Such is the encomium of Watelet, but in the opinion of the writer of this article, our countryman Strutt has more juſtly eſtimated this lady's talents. Her merits reſide far leſs in her indications of local colour, than in the drawing, characters, and expreſſions of her heads and hands. In the plate of Moſes ſtriking the rock, particularly, theſe parts are ſo ſuperior to the reſt of the performance, as to beget a ſuſpicion that the draperies and landſcape are the work of ſome inferior hand, and perhaps of her ſiſter Frances. Yet the whole is very well kept together, and a pretty good general tone prevails. Of the engravings by this lady we ſhall notice a 4to. book of paſtorals, engraved on ſeventeen plates, including the title-page, after Jac. Stella A ſeries of fifty plates of children's ſports and ruſtic ſubjects, from the ſame maſter, in folio. "The Myſterious Marriage of St. Catherine,

therine, with the Infant Chrift," from the fame, in folio. "Medallion of a Cardinal fupported by Religion, and furrounded by the Virtues," Ant. B. Stella pinx. Cl. Stella f. 1678, in folio. "Mofes expofed on the Nile." Nic. Pouffin pinx. Cl. Stella fc. 1672, in two plates, in folio. "Mofes Striking the Rock," Id. pinx. id. fc. in folio. This piece is efteemed a chef-d'œuvre of Claudine. "The Crucifixion of our Saviour between the Two Thieves," ufually termed "Le Grand Calvaire," id. pinx. id. fc. This is another of the beft works of Claudine. "Peter and John curing a Lame Man in their way to the Temple," Id. pinx. Cl. Stella fc. dated 1679. "A Holy Family," from the cabinet of the king of France, id. pinx. id. fc. in folio. "A Holy Family," with feveral children carrying flowers, Nic. Pouffin pinx. Cl. Stella fc. dated 1661, in folio.

Antoinnette Boufonnet Stella, fifter of Claudine, was born at Lyons about 1635. She enjoyed the fame inftruction as her brother and fifter, and as an engraver was fcarcely inferior to either of them. The two following pieces are the only ones executed by this lady, which have been handed down to us; but they are fufficient to evince that fhe poffeffed very fuperior talents.

"Remus and Romulus, nurfed by a fhe-wolf on the Banks of the Tiber," after Antoine Boufonnet Stella, her brother, in folio. "The Entrance of the Emperor Sigifmund into Mantua," from a long frieze executed in ftucco, in the palace del T. after a defign of Julia Romano.

The Stellas had another brother, named Francis, and, according to Mr. Strutt, a fifter, named Francoife, who affifted Claudine in executing her plates, and who died in the year 1676.

Louis Ferdinand was born at Paris fome time about the year 1630, and was the fon of Ferdinand Elle, who had the honour of inftructing Pouffin. Elle had another fon, of the name of Pierre, who was alfo an engraver, and worked in conjunction with Louis, but why they affumed the baptifmal name of their father, and difcontinued the firname of Elle, does not appear.

Neither of the fons difplayed much talent as an engraver, yet Louis attained fome diftinction as a painter of portraits, and became a profeffor in the French Academy.

A drawing-book, entitled "Le Livre Original de la Portraiture, pour la Jeuneffe, tiré de Bologne et autres bon Peintres, a Paris, 1644," has been afcribed feverally, both to Louis and Pierre, and it is not improbable that they were mutually concerned in producing it. The maffes of light and fhade are tolerably well difpofed in this work, but the outlines not being correct, it is radically defective. Other engravings by thefe artifts, are,

The head of a lady, after Van Dyke, in quarto. The portrait of Nicolaus Pouffin, infcribed V. E. pinxit, L. Ferdinand fecit, an oval, in fmall folio. A feries of ornaments, in the form of friezes, with genii, intermingled with feftoons and garlands after L. Teftelin, fix plates. L. Ferdinand fec. P. Mariette exc. in quarto. A feries of groupes of children, after the fame; fix plates, in fmall folio. St. Potentiana, in a frame, from Correggio, in quarto.

Nicolas Bazin was born at Troyes, in Champagne, about 1636. He was the pupil of Claude Mellan at Paris, where he became a printfeller. He himfelf engraved a great number of pieces, but he alfo employed feveral young artifts to affift him in his labours. His productions, for the moft part, confift of portraits and devotional fubjects, engraved in a ftiff and dry manner. They are ufually in quarto, infcribed with the name of Bazin, and the beft of them are entitled as follow:

"The *true* Portrait of the Virgin, painted by St. Luke." "The Annunciation of the Virgin," in folio. "A Chrift crowned with Thorns," in folio. "The Crucifixion," in folio. "St. Jerome and St. Peter," a pair, after Lichery. "St. Francis branded," after Baroccio. "St. Ifabella of France, the Founder of the Abbey of Long-champ," after Ph. de Champagne. "St. Anne learning to read from the Holy Virgin," after Le Brun. "St. Mary the Egyptian, and St. Bozime," after the fame. "A Madonna giving fuck to the infant Jefus," after Correggio, copied from the print of Spierre. "A Female in a fafhionable Drefs, and a Lady of Quality undreffed to enter the Bath," after Jean Dieu, called St. John, a pair, in folio.

Among the portraits of this artift, the following are perhaps the beft.

Madame Helyot, a celebrated abbefs, Bazin del. et fc. 1686. Madame Guyon, the celebrated vifionary. Jean du Houffay de Challiot, who lived as a hermit during forty-eight years at mount Valerien. Father Emanuel Magnan of Touloufe, of the order of the Minor Brothers. Father Antoine Verjus, who firft led the Jefuit miffionaries to China, after B. Cary. Father Jean Craffet, of the fraternity of the Jefuits, and director of their congregation at Paris, after Mee. St. Francis Xavier, the Jefuit apoftle of India. St. Ignatius Loyola, founder of the order of Jefuits, Louis the Great, on horfeback, N. Bazin fc. 1682, in folio. Louis, dauphin of France, painted by J. B. Martin, and engraved by N. Bazin, 1686, in folio.

Peter Landry, who was born at Paris in the year 1630, according to Huber, is one of thofe artifts who did not enjoy a reputation commenfurate with their merits. He engraved various pieces, both from his own compofitions, and after thofe of other artifts. His portraits are executed with much ftrength and neatnefs. Strutt, however, is of a different opinion, and calls them "ftiff and heavy."

The following are a few of his hiftorical works, which are beft known, and are all of the folio dimenfions. "St. Jerome." "A Madonna, with the infant Chrift in his Cradle." "The Samaritan," after Albano. "A large Head of John the Baptift," after Caracci.

Of his portraits, we fhall mention thofe of Louis XIV. after J. François. Louis de Bourbon, prince of Conti, after Gribelin. Charles de Bourbon, bifhop of Soiffons, infcribed Jo. Laniele del Petrus Landry fc. 1666. Charles Brulart, marquis of Genlis. An anonymous portrait, which is known to be that of count Harcourt, commonly called le Cadet de la Perle; all of which are in folio.

Jean Frofne was born at Paris about the year 1630. He appears to have dedicated his attention folely to engraving portraits, in which he imitated, with fome fuccefs, the ftyle of Nanteuil; of thefe portraits forty-three were collected by the abbé Marolles. He was, however, qualified to fucceed in other departments of his art, as may be feen from the ornamental plates which he engraved for the collection of grand views of Sebaftian de Beaulieu. We may mention the following folio portraits by Frofne, as poffeffing much merit in the execution.

Claude Baudry, abbé of the Holy Crofs, after le Bon, dated 1657. Nicholas Dauvet, count Defmarez, grand falconer of France, after Streton. Louis de Lorrain, duke of Joyeufe. Henry d'Orleans, duke of Longueville. Nicholas Putier of Blancmefnil, prefident of the French parliament; and M. Dreux d'Aubray.

But all thefe are engravers of mere mediocrity, compared with Robert Nanteuil, who muft ever be regarded as one of the wonders of his profeffion. This admirable artift was born at Rheims in the year 1630, and died at Paris in 1678. Being the fon of a merchant of fmall fortune, he received a claffical

claffical education, yet during the intervals of literature, found time to cultivate the fine arts alfo ; and to mark his decided predilection for that of engraving, he even engraved his thefis in philofophy. He married at an early age, and on vifiting the French metropolis, he voluntarily abandoned all other purfuits, and devoting himfelf entirely to the art of engraving portraits, became the moft original, and perhaps, on the whole, the beft portrait engraver that ever exifted.

He happily lived in an age when his art was patronized. Louis XIV. being made acquainted with his merit, caufed him to draw his portrait in crayons, and was fo pleafed with the performance, that, according to Strutt, he created purpofely for Nanteuil, " the place of defigner and engraver of the cabinet, with the yearly penfion of a thoufand livres, which was confirmed by letters patent," and which our artift continued to enjoy with the higheft reputation to the time of his death.

When the great care and precifion beftowed on his engravings are confidered, and when is confidered alfo the fhort period of his life, and that the charms of his converfation occafioned his fociety to be courted by men of the firft rank in the ftate, as well as thofe of the firft genius in fine art, it may juftly excite furprife that he fhould have produced no fewer than two hundred and eighty plates, fome few of which are hiftorical fubjects, but moft of them portraits, of which fome are as large as life, and were engraven from nature, through the medium of crayon pictures executed by the engraver himfelf. We have mentioned two hundred and eighty, becaufe that number were found in the collection of Mariette ; but it is not known that Mariette had collected the whole of his works.

Nanteuil appears to have underftood the " human face divine" better than any of his predeceffors. He drew correctly ; even his flighteft prints manifeft the hand and mind of a mafter ; and in his more highly finifhed works, the perfect keeping of his heads, as they appear in the fine impreffions, is admirable. Strutt argues that " from the great difference we perceive in the characters of his heads, we may conclude they were faithful copies of Nature," and when this is combined with the ftill ftronger prefumption arifing from homogeneoufnefs of parts, it will probably be received as the ftrongeft internal evidence, and the beft affurance that can now be obtained, of the refemblance of Nanteuil's portraits to their refpective originals.

His ftyle of engraving he appears to have varied on principle, at different periods of his life ; at firft, probably, as his feelings, and afterwards as his judgment, directed. It was Nanteuil who firft explored the unknown practicabilities of this department of art, and invented modes of combining lines with ftippling, fo as to exprefs the firm foftnefs of flefh whether in light, fhade, or middle tint : hair, with all its lightnefs of forms, its native glofs, and its varieties of flow and colour : ermine he alfo taught his fucceffors to characterife, and the peculiar textures of the various articles of drefs. The engravers who will compare Nanteuil's works with each other, may trace in them what ought to be called a courfe of the experimental philofophy of portrait engraving, over which genius prefided. He appears at firft, like Mellan, to have employed fingle courfes of lines, as may be feen in his portrait of Louis Heffelin : in the flefh of that of Chriftina of Sweden, he employed ftippling alone ; while in that of the prefident Mole, he employed only unbroken lines. It would appear that he was now analyfing his art, and meafuring his own powers againft its difficulties, and that in his fubfequent works, he combined the elements which he now afcertained, of foft, firm, clear, rich, mellow, and characteriftic furface, as occafion admitted or required. His moft frequent and moft admired practice was, to ftipple the lights and half tints of his faces, and employ crofs hatchings, fometimes with interwork, for the fhadows, infenfibly blending his carnation tints, (as a painter would fay,) except where abruptnefs was demanded by the fubject ; and over all, unfwayed by the ornamental tendency in that luxurious age of the art of his country, he threw the ineffable charm of fimplicity.

The more rare and beautiful of the works of this diftinguifhed artift are as follow :

A folio plate of " The Holy Family," which, as has been mentioned, he engraved for the thefis of philofophy which he fupported at Rheims. From the date of this print, 1645, it appears that it was engraved at the early age of fifteen. An allegorical print of Time difplaying the buft of Louis XIV., while Hiftory records his exploits, in folio. " A Mufe or Genius, and an Eagle fupporting a Crown and various Heraldry, with the Motto, " Fides," in folio. " Cardinal Mazarin, feated in the midft of a Gallery of Bufts and Statues, confulting fome Maps which are difplayed before him," after F. Chauveau, in folio. " Chancellor Seguier, furrounded with the Attributes of Juftice, and of the Arts and Sciences," after Le Brun, in folio. A large head of Chrift, after Guido, dated 1653, in folio. " A Sifter of the Order of Mercy," a buft, dated 1664, after the fame, in folio.

Portraits of the potentates of Europe, of the folio fize, (N. B. when no painter's name is mentioned, they are engraved from the crayon pictures of Nanteuil himfelf,) Anne, Infanta of Spain, queen of France, and mother of Louis XIV. R. Nanteuil pinx. et fculp. 1666, very large. Eight different portraits of Louis XIV. engraved in the various modes which our artift from time to time invented or adopted.

Louis dauphin, fon of Louis XIV. 1677. Louis prince of Condé, 1662. Henry Julius Bourbon, duke d'Anguin, after P. Mignard 1662. Chriftina queen of Sweden, after S. Bourdon, 1654, fmall, and in the peculiar ftyle which has been already mentioned.

Louifa-Maria, queen of Poland and Sweden, after Jufte, 1653. Charles Emmanuel, duke of Savoy, 1668. Maria Jean-Baptifte, duchefs of Savoy, and Regent, after Laur du Sour, 1678. Charles, duke of Lorrain, 1660. John-Frederic, duke of Brunfwick Lunenburg, after Michelin, 1674. Charles II. duke of Mantua, 1652. William Egon, prince of Fuftenburg, cardinal and bifhop of Strafburg, 1671.

The following portraits of illuftrious ftatefmen, warriors, and men of letters, are alfo in folio, and are arranged in alphabetical order.

N. duke d'Albret, 1649 ; this is extremely fcarce. Jaques Ameiot, firft prefident of the court of aids, 1655. Louis Dony d'Attichy, bifhop of Autun, 1663. Henry de Baradat, bifhop of Noyon, Velut pinx. with the bifhop's arms, but without date or fignature. Antoine Barberini, cardinal and archbifhop of Rheims, 1663. Emmanuel Philibert Beaumanoir de Lavardin, bifhop of Mans, after Champagne. Pomponne de Bellievre, prefident of the parliament. Francis Blanchard, abbé of St. Genevieve, 1673. Francis Blondeau, prefident of the chamber of accounts, 1653. Antoine Bachart, abbé of Champigny. Peter de Bonfy, archbifhop of Narbonne, 1678. Jacque Benigne Boffuet, bifhop of Meaux, 1674. Louis de Boucheret, chancellor of France, 1676. Emmanuel Theodore de la Tour of l'Avergne, duke of Bouillon and a cardinal, 1670. Leon le Bouthillier, count of Chavigny, minifter of ftate after Champagne, 1652. Anne Philipeaux Villefavin,

ſavin, widow of Leon le Bouthillier, 1656. Henry-Auguſtus de Lomènie, count de Brienne, ſecretary of ſtate, 1660. Jean le Camus, maſter of requeſts, 1674. Jaques, marquis de Caſtelnau, mareſchal of France, 1658. Marin Careau de la chambre, phyſician to the king. Guy Chamillard, maſter of requeſts, 1664. Jean Chapelin, counſellor of ſtate, 1655. Charles d'Ailly, duke de Chaulnes, governor of Brittany, 1676. Francis de Clermont, biſhop of Noyon, 1655. Peter de Cambert de Coiſlin, biſhop, and afterwards cardinal of Orleans, 1666. Peter-Armand du Cambout de Coiſlin, abbé of St. Gildas, 1658. Jaques-Nicolas Colbert, abbé of Becq, and afterwards archbiſhop of Rouen 1670. Jean-Baptiſt Colbert, miniſter of ſtate, 1676. Francis de Bonne, duke de Crequy des Leſdiguieres, lieutenant-general, 1662. Dreux Daubray, count d'Offremont, counſellor of ſtate, 1658. Peter Payen Deſlandes, 1659. Jean Dorieu, preſident of aids, 1660. Francis-Antoine Dulieu maſter of the chamber of accounts, 1667. John Evelyn, eſq. author of "Sylva Sylvarum; a treatiſe on Calcography," &c. Ferdinand de Foix de la Valette, duke of Eſpernon, colonel-general, 1650. Ceſar d'Etree, biſhop of London, then cardinal, 1660. Andre le Fèbre d'Ormeſſon, counſellor of ſtate, 1654. Gaſpar de Fieubet, counſellor of the parliament of Toulouſe. Nicolas Fouquet, ſuperintendant of the finances, 1661. Pierre Gaſſendi the philoſopher, 1658. Melchior de Gillier, counſellor of the king, 1652, and madame de Gillier his wife, a companion print. Francis Guenault phyſician, 1664. Henry de Guenegand, marquis de Planey, ſecretary of ſtate after Champagne. Francis de Harlay de Chauvallon, archbiſhop of Paris, 1675. Louis Hepelin, counſellor of ſtate, engraved in the ſtyle of Mellan, 1660. William de Lamoignon, marquis de Baville, preſident of the parliament, 1659. Another plate of the ſame nobleman, dated 1676. Peter Jeannen, firſt preſident of the parliament. Dominick de Ligny, abbé and afterwards biſhop of Meaux, 1654. René de Longueil, marquis de Maiſon, miniſter of ſtate and preſident of the parliament, 1660. Henry d'Orleans, duke de Longueville, after Champagne. Francis Lotin de Charny, preſident of the parliament, 1657. Jean Loret of Carenton in Lower Normandy, 1658, ſmall folio. Francis Mallier, biſhop of Troyes, after Velut. Leonor de Matignon, biſhop of Liſieux, after P. Antonin. Cardinal Julius Mazarin, with a back-ground of ſtars, 1655. The ſame ſubject, engraved in the taſte of Mellan. Jean de Maupeoux, biſhop and count of Cavaillon, 1671. Charles de la Porte, duke de la Mellerage, mareſchal of France, after Juſte, 1662. Jean de Megrins, preſident of the parliament of Toulouſe, after Daret, 1652. Jean-Antoine de Meſme, count d'Avaux, 1662. Edward Mole, preſident of the parliament, 1653, (noticed in our biography of the artiſt.) Henry de Lorraine, marquis of Mony, 1651. Francis de Neſmond, biſhop of Bayeux, 1663. Nicholas Potier de Novion, firſt preſident of the parliament, 1656. Charles Paris d'Orleans, count de St. Paul, after Ferdinand, 1660. Hardouin de Perefixe de Beaumont, archbiſhop of Paris, 1662. Louis Phelipeaux de la Vrilliere, ſecretary of ſtate, 1662. Simon Arnauld de Pomponne, ſecretary of ſtate, 1657. Jean Francis Paul de Gondy, cardinal de Retz, 1650. Armand-Jean du Pleſſis, cardinal de Richelieu, after Champagne, 1657. Jean Francis Sarraſin, counſellor to the king, 1656, in 4to. Henri de Savoye d'Aumale, archbiſhop of Rheims, 1651. Pierre Seguier, chancellor of France, after le Brun, 1656. Pierre Seguier, marquis de St. Briſſen, mayor of Paris, 1659. Francis Servien, biſhop of Bayeux, after Champagne, 1656. Jean Baptiſte van Steenberghen, termed "the Dutch advocate," after du Chaſtel, 1668. This is eſteemed a chef-d'œuvre of Nanteuil. Denis Talon, advocate-general. Charles-Maurice le Tellier, archbiſhop of Rheims, 1663. Michel le Tellier, chancellor of France, 1662. Michel le Tellier, marquis de Louvois, ſecretary of ſtate, 1677. Henri de la Tour d'Auvergne, viſcount de Turenne, 1665. Francis de la Mothe le Vayer, 1661.

Germain Audran was born at Lyons A. D. 1631. He acquired the rudiments of his art in his natal city, and under the ſanction of his father Claude, of whom we have already ſpoken; after which he repaired to Paris, where he purſued his ſtudies under the direction of his uncle Karle. He afterward returned to Lyons, where he engraved and publiſhed a conſiderable number of prints, conſiſting of ornaments, ceilings, vaſes, &c. and a few portraits, which Strutt ſays do honour to his graver. He was made a member, and afterwards choſen profeſſor of the academy eſtabliſhed at Lyons, in which city he died in the year 1710, leaving four ſons who were all artiſts.

His beſt portraits are thoſe of Charles Emanuel II. and Frances d'Orleans, in the ſame oval, after Caravaglia; cardinal Richelieu in an oval, ornamented by laurels, and Theophilus Reynard, dated 1663, in folio.

The chief of his other engravings are a ſet of ſix plates of deſigns for ceilings, after George Charmetin; another ſet of ſix ornamented vaſes after N. Robert; a book of friezes, after la Fage, a large book of Italian views after Funeus, ſix landſcapes from le Gaſpie, and a ſet of thirty deſigns for fountains and maritime friezes, after le Brun.

Of Claude Audran, the ſecond of that name, and whoſe virtues, ſays the abbé Fontenai, were as praiſe-worthy as his talents were great, no engravings have been mentioned by his biographers, and none have been ſeen by the preſent writer, though Heinnekin ſpeaks of him as having been an engraver. He was born in the year 1639, and died at Paris in 1684.

Girard or Gerard Audran is at once the moſt celebrated of his family, and the boaſt of his country and his profeſſion. Though he did not invent the art of mingling etching with the work of the graver, he improved ſo much upon what had previouſly been done in this way, and ſo out-ſtripped his competitors in the race, that it may eaſily be believed he would have invented this art, had it not previouſly exiſted. Untrammelled, or not ſubmitting to ſuch trammels as the mechanical part of the art of engraving impoſed on his contemporaries, he looked with bolder viſion into that of painting, or rather he looked both abroad into the phyſical world, and into the reſources of his own vigorous mind, for the materials of honeſt fame, and was guided alone by the light which they mutually reflected on each other.

That he was thoroughly verſed in the academical part, or grammar, of his art, may be ſeen in his work, entitled "Les proportions du corps humain ſur les plus belles ſtatues de l'antiquité, à Paris, chez Audran Graveur du Roi," a folio work publiſhed in 1682; and it may be heard in the liberal encomium of Le Brun, that the engraver had in this reſpect ſurpaſſed the painter. In juſtice to both theſe diſtinguiſhed artiſts, who ſeemed born for each other, this declaration of Le Brun ſhould not be paſſed in ſilence.

So broad, original, and comprehenſive was the ſtyle of our artiſt, that Watelet has emphatically ſaid of him, "he *painted* with the etching-needle and graver," and ſo ſurpaſſing thoſe of all other artiſts are his engravings after Le Brun, Pouſſin, and Le Sueur, that it may be aſſerted of Audran, almoſt without an hyperbole, that he poſſeſſed the power of animating their forms with his own ſoul, as was fabled of the oriental philoſopher of old.

Thus

Thus much it has been thought neceſſary to ſay in this place, in addition to what the reader will find under the article AUDRAN GIRARD, reſpecting this truly great artiſt. The collector may not be diſpleaſed to find here a more copious liſt of his principal engravings, than we were at that time able to furniſh, beginning with the portraits and other pieces which he engraved after his own pictures and drawings.

Pope Clement IX. Andreas Argolus, S. Marci Eques, in quarto. Samuel de Sorbiere, (a man of letters,) engraven at Rome in 1667. Henri Arnaud, biſhop of Angier. Father Benedict Langeois, a capuchin. Francis du Queſnoy, ſculptor, commonly ſtyled Fiamingo. "St. Paul preaching at Athens," a vignette, with the inſcription :—"Non enim ſumus adulterantes, &c." "Minerva" and "Abundance," two ſtanding figures, and on high two genii holding a ſcroll, with the words "Louis le Grand," a frontiſpiece, in ſmall folio, dated 1680.

After Italian maſters, we find the following ſubjects in folio, and for the moſt part very large; "The Filial Piety of Æneas," after a picture of Dominichino, formerly in the cabinet of the French king, performed with the graver only, and ſomewhat harſh in its chiaro-ſcuro. "The Myſtery of the Roſary," after a painting of Dominichino at St. John du Mont de Bologne. "The Martyrdom of St. Agnes," after a painting of the ſame maſter at Bologna, in the church of that ſaint. "The Temptation of St. Jerome," after the ſame. "The Four Angles of the Church of St. Charles de Catenari, repreſenting Juſtice, Temperance, Prudence and Courage," after the ſame, in four plates, engraven at Rome in 1675. "The Gift of Tongues," and "St. Paul preaching at Athens," after Pietro da Cortona, two friezes on the ſame plate. The gallery painted at Rome in the palace of Pamphili, by the ſame maſter, repreſenting the hiſtory of Æneas, engraven on ſixteen plates, and forming a ſeries. The gallery painted by the ſame artiſt, at the palace of the marquis Sachetti, and engraven at Rome in 1668 in three large plates, repreſenting the triumphs of David over Goliah and the Philiſtines. "The Death of St. Francis," after Annibal Carracci. "The Martyrdom of St. Sebaſtian," after a painting of Carracci formerly in the poſſeſſion of the French king. "The Temptation of St. Anthony," painted for the Borgheſe gallery by Annibal Carracci. "Ulyſſes diſcovering Achilles in Diſguiſe," after the ſame. "St. Hyacinthe," after Guerchino, ſmall. "A Magdalen," after Guido. "St. Peter walking on the Sea," after Lanfranc. "The Nativity of our Saviour," a ſmall piece, engraven after a deſign of Palma the younger, without the name of the engraver. Thirteen plates of arabeſque figures, painted by Raphael in one of the halls of the Vatican. A ſet of fifteen plates from Raphael's Cupid and Pſyche, dedicated to Le Brun. "God ſpeaking to Moſes from the Burning Buſh," after the ſame. "Paul and Barnabus at Lyſtra," after the ſame. "St. Paul ſcourged by Demons," a ſmall piece, known under this title, though in fact it repreſents "St. Ignatius tormented by Devils during his Slumber." It is engraven after a deſign of Rubens, but falſely attributed to Raphael on the plate. "Jeſus Chriſt delivering the Keys to St. Peter on taking leave of the aſſembled Apoſtles," R. V. inv. G. Au. ſc. "The Death of Ananias," after Raphael. "The Landing of the Saracens at the Port of Oſtia;" after a deſign of Raphael, an anonymous engraving, but known to be from the hand of Audran. "A recumbent Silenus, pouring forth Wine," after Julio Romano. "Dejanira carried away by the Centaur Neſſus," after the ſame, in quarto. "The Clemency of Scipio," another anonymous folio engraving, after Raphael. "The Rape of Ganymede," an octagonal print from a painting by Titian on the cieling of the gallery of antique ſtatues at Venice.

Hiſtoric and allegoric ſubjects after French maſters, beginning with Pouſſin. "St. John baptizing his Proſelytes in the River Jordan," a finely executed engraving, on two plates. "The Woman taken in Adultery." A pair of large and admirable engravings of "The Preſervation of Pyrrhus," and "The Reſentment of Coriolanus appeaſed by his Family," each engraved on two plates. "Camillus delivering up the Schoolmaſter to his Scholars," "The Vengeance of Armida," in which plate Gerard was aſſiſted by his nephews Benoit and John Audran. "St. Franciſco kneeling before the Virgin Mary," who is holding arrows. A pair from Ovid's Metamorphoſes of "Daphne transformed into a Laurel," and "Narciſſus to a Daffodil." "The Empire of Flora," or the metamorphoſes of heroes into flowers. "The Plague of Rome," from a large picture which Pouſſin painted from a deſign of Le Main, and which Audran engraved in conjunction with Baronius. "Time and Truth," from a cieling in the hotel de Richelieu, of which plate, the impreſſions before the drapery was engraved over the figure of truth are very rare.

The above are all after Pouſſin : from P. Mignard he has engraven "The Plague of Egina," commonly termed "The Peſt." (In the early impreſſions of this plate, the figure in the clouds is evidently Juno, attended by her peacock ; in the latter impreſſions, the peacock is eraſed, and the wings of an angel are added to the figure of the goddeſs. "Chriſt bearing his Croſs," from an original in the king of France's collection. The cieling of the leſſer gallery of Verſailles, engraved on three plates, of which the ſubjects are "Apollo and the Muſes," "Foreſight and Secrecy," and "Vigilance and Alacrity." Six large plates forming a ſet from the cieling of the Val de Grace, containing upwards of two hundred figures, and repreſenting the felicity of the bleſſed.

From the pictures of Le Sueur he has engraved the Martyrdom of St. Gervais and St. Protais; and on another plate, arched at the top, that of St. Laurence, in folio ; and in quarto, "Aurora bringing forth the Horſes of Phœbus." "Time aſſiſted by Love and Truth diſpelling the Clouds of Ignorance," a circle, after L. Teſtelin, folio. "The Army of Pharaoh ſwallowed up in the Red Sea," after Fr. Verdier, in folio. "The Flight into Egypt," after the ſame, in folio. "Battle with the Saracens," after le Bourguignon, in folio. "The Surrender of the City of Damietta," in folio. "The Deciſion of Solomon," after Ant. Coypel, in folio. "The Deluge," after La Fage, in folio. "The Paſſage of the Red Sea," after the ſame. "The Rape of Proſerpine," after the group in the garden of Verſailles, by Gerardon, in folio. "God ſpeaking to Moſes from the Burning Buſh," after Le Brun, in folio. "The Gift of Tongues," after the ſame painter, wherein he has introduced his own portrait. "The Martyrdom of St. Stephen," after a painting by the ſame maſter in the church of Notre-Dame, in folio. "The Triumphal Entrance of Conſtantine the Great into Rome," after the ſame. "The Cieling of the Chapel de Saulx," repreſenting the fulfilment of the ancient law by the new, after Le Brun, in ſix large plates, dated 1681, and remarkable for a ſuperior diſplay of character, expreſſion, and fine drawing. The cieling of the pavillon at Saulx, known under the name of the Pavillion of Aurora. In this work Le Brun repreſents the riſing of the ſun, and the four ſeaſons ; engraved on four large plates, and inſcribed to Louis XIV. Four very large engravings from Le Brun's battles of Alexander the Great, of which

which the subjects are, " The Passage of the Granicus," " The Battle of Arbela, and Defeat of Darius," " The Reception of Porus," and " The Triumphal Entry of Alexander into Babylon ;" from the largeness of their dimensions, the artist has thought it necessary, or found it most convenient, to engrave each of these subjects on four plates, from which the impressions are afterwards pasted together. They are at once the largest and best of historical engravings, and constitute the triumphal entry of that art into Europe.

Of Benoit Audran the nephew of Girard, having already given a biographical sketch, (see AUDRAN, BENOIT,) it remains only to add the list of his best engravings. We begin with the historical subjects, which are of the folio size.

" The Baptism of Jesus Christ, "after a painting of Albano in the Luxembourg. " The Rape of Dejanira," after Guido. " David beheading Goliah," after a painting (formerly in the cabinet of the French king,) by Michael Angelo, painted on the two sides of a slate, and each representing the same subject differently treated, engraved on two plates in the years 1716 and 1717, by the two brothers, B. and I. Audran, in folio. " A Gypsey telling Fortunes," after the same master, in the collection of Crozat. " Lot and his Daughters," after Paul Veronese, in the collection of Crozat. " Disgust," after the same master, the original of which was in the Palais Royal.

The following are after pictures by Le Brun : " Moses defending the Daughters of Jethro," a large piece engraven by John and Benedict Audran in conjunction. " The betrothing of Moses and Zipporah," companion to the preceding, wholly engraven by Benedict. " The Brazen Serpent raised by Moses in the Desert." " The Purification of the Virgin, or Simeon in the Temple," a piece marked Audran fec. et exc. " Jesus Christ taken from the Cross," after a painting in the Luxembourg. " Descent from the Cross," after a painting in the Louvre, dedicated to cardinal de Noailles. " Holland accepting Peace," after a painting in the gallery of Versailles. " The Baptism of Jesus Christ," after P. Mignard. " The Pleasures of Horticulture," after the same master, two large friezes engraven by Benedict and John Audran. " Our Saviour at the House of Martha and Mary," after Le Sueur, a large plate, dated 1690. " St. Paul preaching at Ephesus," after the same. " Alexander during his Sickness taking the Potion presented to him by his Physician," a circular print, after the same master, from a painting in the Palais Royal, engraven 1711, and esteemed one of the best works of Benoit. " The Accouchement of Mary de Medicis," and " The Exchange of Two Queens," two beautiful engravings from the gallery of Rubens in the Luxembourg. The twelve months of the year, on six folio plates, forming a set, from paintings by Cl. Audran the younger.

His principal portraits are as follow ; Benedict or Benoit Audran, engraver to the king, painted by J. Vivien, and engraven by himself, in octavo. Louis Thomas de la Valette, general of the oratory, inscribed B. Audran fecit ad vivum, in folio. Renaud of the oratory, after Bonnet, in folio. Charles le Goat, archbishop of Narbonne, after Bon of Boulogne, an oval, engraven in 1708. John-Baptiste Colbert, after Cl. le Fevre, an oval, with accessaries. Joseph-Clement, elector of Cologne, after J. Vivien, in folio. Maximilian-Emanuel, elector of Bavaria, marked J. Vivien pinx. Il se vend le dit Sieur, in folio. Henry de Beringhen, first equerry to the king, marked Nanteuil del. 1663. Bened. Audran fc. 1710, in folio. Samuel Frisching, general of the Swiss. J. Huber pinx. Bened. Audran fc. Parisiis 1713, in folio. John Frederic de Willading, consul of the republic of Berne, 1718. J. Huber pinx. B. Audran fc. in folio. The equestrian statue of Louis XIV. erected at Lyons, after Desjardins, conjointly engraven by B. and J. Audran, in folio.

John Audran, the younger brother of Benoit, having distinguished himself, as has already been observed, at the early age of twenty years, and continuing to engrave till he was eighty, produced a considerable number of prints which are highly esteemed. To the list of his engravings, which the reader will find under the article AUDRAN, JOHN, we are now enabled to add the following, beginning with the religious subjects and those from classic history, which are mostly of the folio size.

" Jesus Christ preaching on shipboard," after Raphael. " A Landscape," in which the infant Jesus is represented in a recumbent posture, contemplating a cross, which is held by three angels in the clouds, after Albano. " The Nativity," after P. da Cortona, an oval. " The Good Samaritan," after Annibal Carracci, round. " Saint John administering the Sacrament to the Virgin," after L. Carracci. " Jesus on the Mount of Olives," after Dominichino. " St. Andrew adoring the Cross on which he was to suffer Martyrdom," after Guido. " The Martyrdom of St. Peter," after Guido, erroneously inscribed with the name of Dominichino. " St. Paul preaching at Athens," after Ciro Ferri, a small piece in the form of a frieze. " Galatea on the Waters," after C. Maratti, a very beautiful piece, in folio. " The Miracle of the Loaves and Fishes," after Claude Audran, in folio. " Jacob complaining to Laban," and " The Resurrection," both after Coypel, the latter of which is esteemed amongst the French, one of the most distinguished works of that painter. " The Elevation of the Cross," and " The Crucifixion," both after Vandyke. " The French Parnassus of Titon du Tillet," a very large plate, of which the original is executed in bronze. " Acis and Galatea," with Polyphemus on his rock, after F. Marot. " Venus irritated against Psyche," and " Psyche consoled by Cupid," both after Nattier. A landscape after Poussin, in which is introduced St. John, the two Maries, Nicodemus, and two angels weeping over the body of Jesus Christ. " The Rape of the Sabines," after the same master, esteemed the best of the engravings of Audran, and a very successful translation of the original picture. " Andromache flying to the Aid of her Son," after L. Silvestre, and three mixtures of fact and allegory, after Rubens, *viz.* " Henry IV. deliberating on his future Marriage." " The same Monarch preparing for the War in Germany," and " The Coronation of the Queen."

The following are portraits, and are all of the folio size. Louis XV. on foot, inscribed Gobert pinx. Audran fc. Anonymous portrait of the prince with a page, after Vivien. Clement Augustus, prince of Bavaria, after the same. Jean-Baptiste Colbert, marquis de Torcy, without his name, after Largilliere, in an oval. Duke of Autin, also in an oval. The abbe Victor-Marie d'Etrees, after Largilliere. Cardinal Pierre Ottoboni, after Le Trevisan. Fenelon, archbishop of Cambray, after Vivien. Pierre Gillet, after Tortebat. Francis-Robert Secousse, doctor of the Sorbonne, seated in an arm chair, after Rigaud. Peter-Paul Rubens, after Van Dyke. Noel Coypel, painter in ordinary to the king, after himself, and Anthony Coysevox, sculptor in ordinary to the king, after H. Rigaud. The two latter were engraven at the time of our artist's reception into the Royal Academy, (namely in the year 1703,) and, either on account of their merits or their subjects, were the means of that reception.

John Baron, or Baronius, also called the *Tolosano,* from the

the place of his nativity, was born at Toulouſe in the year 1631, but ſettled at Rome early in life, where he engraved and publiſhed almoſt the whole of his works. He executed his plates entirely with the graver, in a ſervile, dry manner, neat indeed, but exceedingly defective in drawing, expreſſion, and effect. Yet he had the inſenſibility to attempt great things, of which the following are the ſubjects of a few:

"The Martyrdom of St. Stephen," and that of "St. Andrew," a pair of folio prints, after Nicolo del Abbate. "St. Peter," and "St. Paul," after A. Carracci, a plate in which the heads and hands are engraven by Bloemart. "A Madonna in the act of Adoration," from Guido, in 4to. and another from Bernini. "St. Romualdo," founder of the Camaldales, in which ſeveral eccleſiaſtics are introduced, aſcending to heaven, an upright folio, after Andrea Sacchi. A ſet of twelve plates forming an elementary drawing book, after P. Ferrerio, in folio, and the "Plague of the Philiſtines, with the fallen Idol Dagon," a folio plate after Pouſſin.

But we are chiefly indebted to Baronius for the following portraits, which are of the folio ſize. John de Plantevit de la Pauſe, biſhop of Loudon. Cardinal Aquaviva. Leonardo Alberti, architect. Vito de Bramante, architect. Giovani Franceſco Ruſtici, ſculptor. Marc Antonio Raimondi, engraver. Raphael d'Urbino, painter. Leonardo da Vinci, painter, and others of diſtinguiſhed artiſts, amounting in the whole to fifty.

Charles Mace has been frequently confounded with F. B. Maſſe, the miniature painter. He was employed by M. Jabach, to copy drawings in his poſſeſſion, and to etch the maſterward; and the following hiſtorical landſcapes, after Caſtiglione, are from his hand.

"The Angel commanding Noah to ſtore the Ark with Animals." "Abraham and Sarah on their Way to Egypt." "The Bleſſing of Abraham." "Abraham taking leave of Hagar." "Rebecca departing for Meſopotamia." "Jacob returning to his Father's Houſe." "Rachael returning from Meſopotamia." "Jacob ſending Preſents to his Brother Eſau." "Moſes expoſed on the Nile." "Moſes departing with his Wife and Children for Egypt." The "Nativity," and the "Crucifixion."

The time of the birth of John Picart, who flouriſhed about the middle of the ſeventeenth century, has not been mentioned. He is believed to have been a native of Paris, and to have reſided chiefly in that city; but to have ſtudied engraving under Criſpin de Paſſe. He engraved ſeveral portraits, among which are thoſe of Edward, infant of Portugal, in a ſmall upright oval, with emblems; and a whole length of Eraſmus ſtanding in a niche, beſide other frontiſpieces for books; but his merit is too inconſiderable to deſerve further notice here.

Etienne, or Stephen Picart, is preſumed by Strutt to have been related to John, and to have aſſumed the appellation of "La Romain," (the Roman,) that his works might not be confounded with thoſe of his relation; but from this miſtake his ſuperiority as an artiſt ſufficiently protected him, nor need he, nor would he, with the conſciouſneſs of this ſuperiority, have aſſumed a ſir-name to mark it. A more reaſonable ſuppoſition is, that he choſe to be called Picart the Roman, from a vanity of telling the world that he had ſtudied at Rome. He was born at Paris A. D. 1631, and after reſiding ſome years in Rome returned to his native city, where he became a member of the French academy, and obtained the title of engraver to the king. He died at Amſterdam, (whither he had retired with his ſons,) at the advanced age of ninety.

According to Watelet, Picart executed ſome plates in which etching predominates; but his principal works are performed with the graver only, in a ſtyle ſomewhat reſembling that of Fr. de Poilly, though with inferior ability; yet it is worthy of remark, that ſome paſſages in his works are very ſuperior to the reſt, as for example, the boy who ſtands in the left-hand corner of his "Peſtilence among the Philiſtines," after Pouſſin, and the livid female who lies dead toward the middle of the fore-ground, and whom the child would ſuck, are ſuperior to the tenor of the plate, though it be reckoned among the very beſt of his engravings. The cold lividneſs, which is properly ſpread over the boſom of this dead mother, pervades his ſtyle; his heads in general are thoſe of Pouſſin vulgarized, his extremities are not marked with feeling, and his chiaro-ſcuro is deficient in harmony.

Of the numerous engravings of S. Picart, it may ſuffice to mention the following, which are all in folio.

"An Ecce Homo," accompanied by three Angels, after C. Albano. "The Nativity of the Virgin," after Guido, dedicated to Le Brun. "The Nuptials of St. Catherine," after Correggio. A pair from the ſame painter, of "Heroic Virtue triumphing over Vice," and "Man delivered up to the Pleaſures of Senſe," dated in 1676. Another pair, of "St. Cecilia playing on the Baſs-Viol," and a "Concert of Muſic," after Dominichino, in folio. "A Holy Family," known under the name of "Silence," after Carracci, which has ſince been put to ſhame by the beautiful and maſterly engraving of the ſame ſubject, from the hand of Bartolozzi. "The Holy Family," after a grand compoſition of the elder Palma. "The Separation of St. Peter and St. Paul," after J. Lanfranc. "The Plague of the Philiſtines, and the Overthrow of the Idol of Dagon," after Pouſſin. "Jeſus curing the Blind, on leaving Jericho," after the ſame, inſcribed Picart, (le Romain,) exc. "The Adoration of the Shepherds," after the ſame. "St. Paul cauſing the Books of the Epheſians to be burnt," after le Sueur. "The Martyrdom of St. Gervais, and St. Protais," after the ſame. "The Martyrdom of St. Andrew, and that of St. Stephen," after Le Brun. "The Adoration of the Kings," after Guil. Courtois. "A Madonna, with the infant Jeſus on her Knees," after Noel Coypel. "St. Anthony of Padua, adoring the infant Jeſus," after Vandyke.

The beſt portraits engraved by this artiſt are as follow: Jean-Francois, Paul Gendy, cardinal of Retz, in 4to. A piece executed in the ſtyle of Mellan, and from Picart's own drawing. A buſt of cardinal Fachenettus, after J. M. Morand, in 4to. P. Lucas Waddingus, miniſter-general of the order of St. Francis, after Carlo Maratti. Melchiſedech de Thevenot, a famous traveller, in the oriental coſtume. F. Chauveau del. in folio. Francis Tillemont, abbé of Valchretien, R. Nanteuil del. in folio. Andrew Hameau, doctor of the Sorbonne, Ant. Paillet pinx. in folio. Nicholas Pavillon, biſhop of Aleth. Stef. Picart fecit, in folio. Nicholas Choart de Buſanval, biſhop of Beauvais, inſcribed Stephanus Picart Romanus, fec. et exc. The preſident Claude de Brion, after A. Paillet, in folio, Pierre Loiſel, doctor of the Sorbonne, after F. le Maire, Jean Michel Cigula, a prince of the Ottoman empire, who was converted to the Chriſtian faith, and Frances Athenais de Rochechouart, marchioneſs of Monteſpan.

Bernard Picart, the ſon of Stephen, was born at Paris in the year 1663. He ſtudied under his father, and being admitted to draw from the life at the French Academy at the age of ſixteen, he two years afterwards gained the prize. It is ſaid that he took up the graver with reluctance: he conti-

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nued, however, both to defign and engrave at Paris until the year 1710, when he accompanied his father to Amfterdam, with fome intention of proceeding to Sweden ; but certain offers that were made him by the Dutch bookfellers induced him to alter his mind, and he continued to refide at Amfterdam to the time of his death, which happened on the 8th of May 1733. He was twice married, but it does not appear that he left any children.

Great part of Picart's life was fpent in making drawings, which are highly finifhed, and fufficiently teftify the fertility of his invention. He underftood the human figure, but in the airs of his heads followed too much the fafhion of affectation which Coypel had led. His profeffional induftry muft have been great, for befides making thefe highly finifhed defigns, the number of his engravings are not fewer than thirteen hundred.

Moft of thefe plates indeed were fmall, and were engraved as embellifhments to books, for which he was famous. His ftyle confifted chiefly of etching, and bears confiderable refemblance to that of Le Clerc. According to Watelet, the tafte of the Dutch amateurs of that day impaired the talents of our artift, by inducing him to deviate from the path which nature had pointed out to him, and while he accumulated a fortune, he loft the efteem of the judicious. If his larger works were done to pleafe thofe amateurs, Watelet's remark is not without foundation, for they are cold, tame, and taftelefs, when compared with his fmall plates.

He fcraped a few mezzotintos, among which is a Nativity from Carlo Maratti, and, poffeffing a certain degree of dexterity in imitating the works of other artifts, he undertook, towards the clofe of his life, what he called *innocent impoftures*, which, however, were not publifhed till after his death, and which Strutt thinks had better not have been publifhed at all ; it confifts of feventy-eight plates, forming, with the preliminary difcourfe, explanations, and lift of his works, a fmall folio volume.

Of his other engravings, the moft remarkable are, " The Maffacre of the Innocents," in fmall folio, from his own defign, the firft impreffions of which are known by their being printed before the crown was placed on the head of Herod. " The Epithalamia," a fet of twelve plates, valued for the tafte and delicacy with which they are executed, and confifting of eight prints lengthways, and four uprights, in quarto. " The Annals of the Dutch Republic." Of thefe are particularly remarkable the frontifpiece, which is " The prince of Orange," " The Maffacre of De Wit," and " The Synod of Dort ;" five allegorical frontifpieces for Roman Antiquities, Religious Ceremonies, Banier's Ovid, and the Dictionnaire and Atlas Hiftorique, folio. " Philofophers in Search of Truth, at the Head of whom is Defcartes," dated 1703, in folio. " Feftival of the Gods, and of the Cæfars," a fubject taken from the Cæfars of the Emperor Julian, in folio. " The Triumph of Painting," engraven in 1725, in folio. " The Children of Niobé, pierced by Arrows," in folio. Two fatirical folio prints, againft the adminiftration of law. " A Monument confecrated to Pofterity, in Commemoration of the incredible Folly of the 20th Year of the Eighteenth Century."

From the compofitions of other mafters Picart has engraven " Time delivering Truth from the Yoke of the Paffions." " The Remembrance of Death, or Shepherds of Arcadia ;" and an allegorical dance, entitled, " The Picture of Human Life," all after Pouffin. After Le Sueur he has engraven a pair of " The Mufes, Calliope and Terpfichore," and " Darius caufing the Tomb of Queen Nitocris to be opened, in the Hope of difcovering a Treafure ;" and after Le Brun, " Hagar difmiffed from the Houfe of Abraham," dated 1707.

His principal portraits are thofe of Stephen Picart the Roman, engraver to the king, &c. defigned in 1715, (en Medallion,) and engraven by his fon Bernard in 1730, in fmall quarto ; Roger de Piles of Nevers, ipfe pinxit, an etching dated 1714. The following kings of England after Vandyke, Kneller, and Vanderwerf, Charles I., Charles II., James II., William III., and George I. Prince Eugene of Savoy, after Van Skuppen. Louis, prince of Afturias ; John de Wit, grand penfionary of Holland ; Edward Clarendon, lord chancellor of England, after Zouft. Lord William Ruffel, and Frederic, duke of Schomberg, after Kneller. Bifhop Burnet, after Hoadley. Francis Pierre, cardinal de Fox, (who terminated the fchifm, and gave peace to the fee of Rome,) and a medallion of Philip, duke of Orleans, fupported by Apollo and Minerva ; after A. Coypel.

Nicholas Petau was the fon of James Petau, an engraver from Antwerp. He was born at Paris in the year 1633, and died in the fame city in 1676. He probably, judging from the ftyle and character of his engraving, ftudied in the fchool of de Poilly. He worked with the graver only, and appears to have handled that inftrument with facility, but his extremities are fomewhat heavy, the degree of correctnefs he has attained in his drawing is a laboured correctnefs, and the fimilarity of texture which he has fpread over his flefh, draperies, and back-grounds, give a certain character of infipidity to his engravings. Watelet however praifes the works of this artift fomewhat highly, and particularly his Holy Family, after Raphael, for beauty of tooling, purity of outline, vigour and juftnefs of effect, and the true rendering of the characters of Raphael.

The following engravings by this mafter are held in moft efteem, beginning with the hiftorical fubjects, which are all in folio.

The above-mentioned " Holy Family," after Raphael, wherein St. John is kneeling, as if to receive the benediction of the infant Saviour. " A Madonna reading, with the Infant in her Arms," after Guerchino, an oval. " Angels weeping over a Dead Chrift," after the fame. " Chrift in the Sepulchre, with feveral attendant Angels," after Carracci. " The Annunciation," after Ph. Champagne. " Jefus Chrift, the Virgin, and St. John in the Clouds, interceding for St. Bruno, while feveral Monks are feen on their Knees," after the fame, engraven in 1657. " A Magdalen in the Defert," after the fame. " A Holy Family," where the infant Jefus is feen careffing the little St John, after I. B. de Champagne. " St. Sulpice, or the Bifhops affembled in Council," after the fame. " A Buft of the Virgin," after Le Brun. " A Holy Family." wherein an angel is feen prefenting a bafket of flowers to the infant Jefus, after Villequin.

His principal portraits are in folio, and are thofe of Alexander VII., on a pedeftal, infcribed P. Mignard pinx. Romæ, N. Pitau fculp. Parifiis, 1662. Louis XIV., a three-quarter figure in armour, Cl. le Feure pinx. Louis Dauphin, fon of Louis XIV., after the fame. Benjamin Prioli writing the hiftory of France in Italian ; after the fame, fmaller in fize. Nicholas Colbert, bifhop of Luçon, after the fame. Alexander Paul Peteau, counfellor to the parliament, after the fame. Henri-Louis Hubert de Montmor, after Champagne, 1667. Oliver Cromwell, after Vanderwerf. Ambrofe Chapelle, bifhop of Anvers, feated at a table, after H. Perez Brant. Cafpar de Daillon du Lude, bifhop of Albi, after Jufte van Egmont. Vincent de Paul, paftor of the congregation of St. Lazarus, after S. François

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çois. Sir Francis de Sales, bishop and prince of Geneva, after nature, and Louis Alexandre de Bourbon, count de Thoulouse, and admiral of France, after Gobert, inscribed N. Pitau junior sc.

Louis Cossin was born at Troyes, in Champagne, A. D. 1633, and lived till about the close of the century. For some reason or other, he frequently altered the orthography of his name, and Coquin, Cauquin, Cossin, and Cossinus, are all the same person. He worked, with the graver alone, in a poor and tasteless style, and is also deficient in drawing and chiaro-scuro. His best historical engravings are in folio, and their subjects as follow :

"A Madonna" after Le Brun, and, from the same master, "The Martyrdom of St. John the Evangelist." "The School of Athens," after Raphael, a very large plate. "Paul stoned at Lystra," after J. B. Champagne, and a figure of sculpture, published in the Cabinet des Beaux Artes, 1690.

The chief of Cossin's portraits, which are justly held in more esteem than his historical works, are those of Louis XV., as large as life ; and inscribed L. Cossin ad vivum pinx. et. sc. Jean Doujat Juris-consulto François, after F. Suré. Valentin Conrat, of the French Academy, after C. Le Fevre. Francis Chauveau, designer and engraver, after the same. Louis Roupert, a goldsmith of Metz, inscribed P. Rabon pinx. L. Cossinus sc. Jean de Schulenbourg, comte de Mondejeux, after Bernard, L. Coquin sc.; and Charles Jean Comte de Koenigsmark, after M. Dahl, all in folio.

Gerard Edelinck, the countryman of Bolswert, Vorsterman, and Pontius, appears to have formed his style of engraving before he quitted Antwerp, and probably from studying the works of those distinguished masters. He arrived in Paris soon after the middle of the seventeenth century ; where his merit immediately shone forth, and in that age and country of liberal patronage readily procured him the favour and protection of Louis XIV. He became a member of the French Royal Academy, and the king honoured him with an apartment at the Gobelins, an annual pension, and the title of Chevalier. In the year 1707 he died in the French metropolis at a very advanced age.

Though Edelinck was contemporary with Audran, and must have seen the vigour and picturesque feeling which the admixture of etching imparted to his historical works, and must have heard, and probably joined in, the encomiums that were justly bestowed on them, he did not deviate from that mode of building up for himself, a lofty and lasting reputation, which nature and education had marked out for him. Reckless of the halcyon gales which seemed to court his canvas, he steadily pursued his original course ; and with the graver alone he ploughed up the ample field of his fame. Wedded to the style he had adopted in the earlier period of his life, he did not, in his maturer age, allow the superior charms of the youthful and admired mistress of Audran to disturb his settled affections.

It would appear, however, that the cognoscenti of the seventeenth century were much divided in opinion, as to the relative merits of these two modes of engraving, and, notwithstanding what is now thought on the subject, Edelinck might possibly, among his contemporaries, find even more admirers than Audran. Much to the honour of the latter artist, it has been said that he recommended Edelinck to Le Brun's notice, to engrave "the Tent of Darius," from a modest persuasion that his own powers were inadequate to the delicacy of the task. It is pretty well known that at the period now spoken of, the means were by many mistaken for the end of engraving. The ignorant gradually learn to worship the idol itself, that was at first set up merely to stimulate their devotion, and lead their minds to the contemplation of divine perfections ; and clear and clean cut lines were a quality in the engraver's art more vulgarly obvious than exquisite drawing, or delicate energy of expression.

Such might be the nature of the admiration of the majority with respect to engraving at that period; but the art of Edelinck added, to these more obvious and superficial qualities, the profundities of science ; and though the freedom, delicacy, and address, with which he handled his graver, are admirable, yet his application of that freedom, delicacy, and address, is not less so. How well he understood the human figure, and how beautifully, in engraving his flesh, he tempered his courses of lines, and mingled them with stippling, may be seen in the figure of Christ in his large plate of "The Crucifixion," after Le Brun : the head of this figure also shews how deeply he studied the energies and ordonnances of character and expression in the originals which he copied, and how thoroughly empowered he was to render them with effect.

Under such circumstances, though posterity should bestow the palm of superiority on Girard Audran, it will not be surprised that Edelinck chose rather to be the first engraver in a style that had already been honoured with general approbation, than to enter into a rivalry, which might have ended in confirming him *the second* historical engraver of his age.

Strutt writes of our artist with great truth, that "he succeeded particularly in the heads of his figures, which are often uncommonly fine. He certainly understood the human figure, yet he did not draw it with that great taste and correctness which is so remarkable in the prints of Girard Audran; neither are his hands and feet marked in that masterly manner, or with equal truth. And if we compare that excellent engraving by him, representing the tent of Darius, from Le Brun, which he has finished in so beautiful a manner, with the battles of Alexander, by Audran, from the same master, we shall readily agree, I believe, that the animation, correctness, and taste, which we find in the latter, amply compensate for the want of that clearness and neatness, which appear in the execution of the former.

Among the most estimable prints by this great artist, may be reckoned the following:

"A Battle between four Horsemen," with much of the general air and character of a composition of Rubens, after Leonardo da Vinci, mistakenly inscribed on the plate "De la Finse pinxit," a scarce and valuable print, in large folio. "A Holy Family," with Elizabeth, St. John, and two angels, one of which is scattering flowers, an upright folio, from the famous picture of Raffaelle, which was in the king of France's collection. The first impressions are known by their having been taken before the arms of Colbert were added at the bottom of the plate; the second edition is with the arms, and in the third the arms are taken out, but the place where they had been inserted is very perceptible.

From the pictures of Le Brun, Edelinck has engraven "The Crucifixion of Christ," a very large and beautiful engraving, on which we have already commented, and which, from its large dimensions, (three feet in height,) the artist has engraven on two plates. "Mary Magdalen bewailing her Sins, and trampling upon the Riches of the World," a middling-sized upright, the proof impressions of which are known by their having been taken before the subject was surrounded by a narrow border. "St. Louis at Prayers," and St. Charles Boromeus, its companion. "Alexander entering the Tent of Darius," a very large print, engraved on

on two plates of a ſize correſponding with Audran's battles and triumphal entry into Babylon, (of which the firſt impreſſions have the name of Guyton, the printer, ſcratched underneath with the dry needle.)

Edelinck has alſo engraven, in concert with Drevet, another large print, on two plates, of the ſame ſubject, (Alexander entering the Tent of Darius,) from the original of P. Mignard: and from P. Champagne, "Moſes with the Tables of the Law," engraved in concert with Nanteuil.

Among his beſt portraits will be found thoſe of C. Le Brun, from a painting by himſelf; the three following, after Hyacinthe Rigaud; namely, M. d'Hozier the genealogiſt; Martin Vanden Bogaert, the ſculptor; and Madame Helyot; and after P. Champagne, a portrait of himſelf, and thoſe of Arnald d'Andilli, and Nathaniel Dilgerus.

Guillaume Chateau, (or Caſtellus,) was born at Orleans A.D. 1633. His ſtrong deſire of purſuing the fine arts induced him at an early period of his life to remove to Lyons, in order to viſit Italy at a convenient opportunity. After having worked in that city for ſome time at the profeſſion of engraving, he determined to go to Rome; where hearing, on his arrival, of the reputation which Frederic Greuter had acquired as an engraver, he courted his acquaintance and became his diſciple. Under Greuter he completed his ſtudies; was ſoon employed to engrave the portraits of the popes; and had numerous other plates put into his hands, in which he ſucceeded ſo well as to eſtabliſh his character as an artiſt.

He now travelled to Florence, Parma, Genoa, and other ſeats of art, in order to contemplate the works of the great maſters, and afterwards returned to Lyons, where he remained ſome time with the marquis de Sonozin. From Lyons he removed to Paris, and continued to reſide there under the patronage of M. Colbert till the time of his death, which was occaſioned by a violent fit of the cholic in the year 1683.

Chateau worked chiefly with the graver, of which he poſſeſſed great command; but in ſome inſtances has etched his landſcape back grounds. There is much clearneſs in his ſtyle, but from the ſquare manner in which his firſt and ſecond courſes of lines interſect each other, a cold and metallic effect is produced. His drawing is ſtiff and laboured, and not always correct, and the extremities of his figures are but poorly marked: in ſhort, his works ſeem produced by labour and care, rather than by genius and taſte.

The principal hiſtorical engravings of Chateau are of the folio ſize, and their ſubjects as follow:

"The Prophets David, Daniel, Jonas, and Habakkuk," from a painting attributed to Raffaelle, in the church of Madonna del Popolo, but according to Botari, painted by Roſſo; engraved on two plates. On a third plate, our artiſt has converted theſe doubtful prophets into the four evangeliſts. "The miraculous Fiſh," after Raffaelle. "The Baptiſm of Jeſus Chriſt," after Albano. "Ananias reſtoring Sight to St. Paul," after P. da Cortona. "The ſtoning of St. Stephen," after Carracci. "The Aſſumption of the Virgin," after Carracci. "The Saviour with the Croſs, meeting St. Peter," who ſays to him, "Domine quo vadis, &c." after the ſame. "Repoſe during the Flight into Egypt, or a kneeling Madonna admiring the infant Jeſus lying aſleep on ſome Straw," an oval, engraven by Chateau, but without his name, or that of the painter, which is Correggio. "A Holy Family," in which the infant Saviour is ſtanding on a globe, after Carlo Maratti.

From the admirable picture of Pouſſin, Chateau has engraven "The Iſraelites collecting Manna in the Wilderneſs;" "Chriſt reſtoring Sight to the two blind Men of Jericho;" "St. Paul caught up into the third Heaven;" "The Death of Germanicus," one of his beſt prints; and "The Preſervation of the young Pyrrhus," all, excepting the latter, engraved for the collection entitled "The king of France's Cabinet." After Noel Coypel we find "A Holy Family," containing five figures, and a Madonna and Child, in a border of flowers; and after his own compoſition, "A Holy Family," and "A Repoſe during the Flight into Egypt," the latter of which is partly a plagiariſm from Correggio.

Of his portraits the beſt are, the biſhop of Ruette; Jean Baptiſte Colbert, an oval; and thoſe of the popes, which have been already mentioned.

Nicholas Chateau is ſuppoſed to have been a relation, and perhaps the ſon, of William. He was born at Paris A.D. 1680, but of his death, or the courſe of his ſtudies, we find no account.

His beſt works are a portrait of Boucherat, from a drawing of his own. A half-length figure of "A young Lady richly attired and holding a Maſk," after Santerre, and dated 1708. "A young Lady dreſſed in the Spaniſh Coſtume, ſitting," after the ſame painter. "Summer," after Peter Van de Berg. "A young Female ſinging, habited in the Grecian Coſtume," a ſmall folio, dated 1708. "Venus attempting to diſſuade Adonis from going to the Chace," dated 1706. "The Transformation of Daphne into a Laurel." "Rinaldo and Armida," dated 1708, all after L. Silveſtre. "St. Jerome in the Deſart," after Balth. Peruzzi, engraven by Chateau in conjunction with L. Surrugue.

Pierre Simon was born at Paris in the year 1640. He preſumptively ſtudied in the ſchool of Nanteuil. Like him he painted and engraved portraits from the life, and theſe are his beſt works: indeed they poſſeſs no inconſiderable degree of merit.

The only hiſtorical work of Simon with which we are acquainted is the "Martyrdom of St. Cormo and St Damien," a folio plate, after Salvator Roſa. His portraits, which in ſtyle reſemble thoſe by Nanteuil, are not uncommon. Among the beſt of them will be found thoſe of Frederic Baroccio, the painter, in quarto. Charles D'Aelley, duke de Chaulneſs, after de la Borde, in folio. Jacobus Cardinalis Roſpiglioſius, a half-length figure in an oval, very large and ſurrounded by an ornamental border.

In the following, the heads (as appears to have been much the faſhion of the times) are as large as life. That portraits of this very large ſize ſhould be engraven in lines, would appear as ſurpriſing as it is unneceſſary, if it were not ſo common. Louis XIV. after Le Brun, dated 1677. Louis de Bourbon, prince of Condé, dated 1678. Anne Maria Louiſa of Orleans, ducheſs de Montpenſier. Elizabeth Charlotte Palatine, ducheſs of Orleans; all from pictures by Simon himſelf, and Leo Potier de Geſores, abbé and count of Bernais, after De Troy.

Guillaume Vallet was born at Paris A.D. 1636. After acquiring the rudiments of engraving in France, and apparently in the ſchool of F. de Poilly, he travelled to Italy for improvement, but returned after ſome years reſidence at Rome, and died in his native city in the year 1704. He worked with the graver only, and his ſtyle bears an inferior reſemblance to that of de Poilly: yet he is occaſionally deep-toned and vigorous in his chiaro-ſcuro. His principal hiſtorical engravings, which are of the folio ſize, are as follow:

"The Nativity," almoſt ſquare; "Melchiſedec bringing Preſents to Abraham," and the "Lord's Supper," all after Raphael, and the latter inſcribed "Pictum a Raphaele Urbinate Romæ in Palatio Vaticano." "A Holy Family" after

after C. Cæſio, in which the infant St. John is receiving the bleſſing of our Lord. "The Virgin waſhing Linen," after a painting of Albano; a piece commonly known under the name of the "Laveuſe." "A Holy Family, or the Virgin adoring the Sleeping Jeſus," after Guido, almoſt ſquare. Two other holy families after A. Carracci. "Repoſe during the Flight into Egypt," after C. Maratte; inſcribed "Torrentum pertranſivit anima noſtra." "The Annunciation," after Guil. Courtois, brother of Bourguignon. "The Reſurrection of our Saviour," after N. Loir. "St. John the Baptiſt in the Preſence of Herod," after Le Brun. "The Adoration of the Kings," painted at Rome by Pouſſin. "The Aſſumption of the Virgin," after J. Miel, engraved at Rome. "A Holy Family," in which the Virgin is ſeen with the infant Jeſus on her knees, holding out a branch of cherries to St. Joſeph, after Jac. Stella. "Jeſus Chriſt on the Croſs, adored by Angels," after the ſame.

The moſt eſteemed portraits from the graver of Vallet, are thoſe of Alexander Algardi, ſculptor and architect, in 4to. Andrea Sacchi, painter, after C. Maratte, engraven in 1662, in 4to. Olympia Maidalchini Pamphili, Principeſſa di S. Martino, engraven at Rome in 1657. Charles Emanuel, duke of Savoy, in folio, after his own drawing.

The following are all after Paillet, and of the folio ſize. Buſt of Pierre Corneille, crowned by Melpomene and Thalia. William le Roux, biſhop of Perigueux. Antoine Daubray, count d'Offremont, counſellor of ſtate. Nicolas Favre de Berliſe, count of the holy conſiſtory, and "St. Francis de Sales preſented to pope Alexander VII." large, and engraved on two plates.

Anthony Maſſon was born in the Orleannois in the year 1636. He viſited Paris in his youth, but had previouſly been brought up like Coſmo Armſtrong of England, (of whom future biographers will ſpeak,) to the profeſſion of gun-engraving. He who has acquired the power of cutting ſteel with preciſion, has well prepared himſelf for the taſk of cutting copper with freedom, firmneſs, and facility. It was probably in part owing to this early circumſtance of the education of Maſſon, that he acquired thoſe ſurpriſing powers in handling his graver, which Europe has ſince beheld with admiration.

After the example of Nanteuil, who was but ſix years older than himſelf, he now ſat down to acquire the talent of painting portraits from the life, and many of his engravings are done after his own originals. He appears to have had no maſter in fine art, as in ſome reſpects he had no equal: he probably formed his ſtyle, partly from ſtudying the engravings of Nanteuil, but his invention was more vigorous and unbridled; and though he has much leſs of ſimplicity, he has, in his beſt performances, not leſs of exquiſite feeling, of which it was ſcarcely poſſible to have more. In ſome of his works indeed, he appears as if he meant to be capricious and extraordinary, rather than natural, and to ſurpriſe our ſenſes rather than ſatisfy our judgment; and in his "Jeſus Chriſt with his Diſciples at the Houſe of Emmaus," commonly known by the name of "The Table Cloth," as well as in the face of his elector of Brandenbourg, and other of his portraits, are many of theſe eccentric paſſages, though mingled with others of uncommon merit. In the arms of the figure immediately to the left of Jeſus Chriſt, in the drapery and hat of the diſciple to the right, and in the clouds above, Maſſon has twiſted and twirled his lines about, as if to ſet ſyſtems at defiance. The whole of the back ground is wild and ſingular, and Watelet has remarked of the dog which is under the table, that he looks as if formed of ſtraw: yet notwithſtanding theſe, and other ſeeming aberrations from all pre-conceived rule, here is ſuch varied expreſſion of the textures of ſubſtances; ſo much harmonious keeping; and the tone of Titian, after whom it is engraved, is ſo truly rendered, that it has, ever ſince its production, been regarded as a valuable ſchool for engravers, and a maſter-piece of the art.

His portrait of Guillaume de Briſacier, commonly known in England by the appellation of "the Grey-headed Man," is another wonderful piece of engraving; and Watelet has juſtly ſaid of it that here we at once recognize the complexion of the original, and the firm ſoftneſs of fleſh in the face, while his hair, and the fine lace of his neck-bands, are not leſs delicately and beautifully wrought.

His portrait of Oliver d'Ormiſſon is alſo extremely beautiful, and is engraved with much more ſimplicity of ſtyle, if we except the operoſity of the hair; while in that of Guido Patin, he has daſhed and pranced about in all his former curvetings and vagaries, yet has harmoniſed the whole ſo admirably, that the moſt faſtidious taſte cannot but acquieſce in the pleaſure it inſpires, and welcome home the performer after his *ad libitum* flouriſhing.

Watelet has many ſenſible and judicious remarks on the ſtyle of this very celebrated engraver. He diſcommends his favourite practice of repreſenting ſingle hairs, detached from the maſs; and in ſpeaking of a portrait which the preſent writer has not ſeen, that of Charles Patin, he ſays "it poſſeſſes much depth of tone, and almoſt exhibits the appearance of real life: we ſee the ſatirical ſmile of this phyſician finely diſplayed—leſs ſo it is true, than that of his father—and his eyes gliſtening with malice; (this ſeems more than ſhould belong to the portrait of a phyſician)—the ermine of his robe is likewiſe pourtrayed with the greateſt accuracy; but in viewing more nearly the lines which conſtitute the face, I obſerve much ſingularity in their diſpoſition, as thoſe which deſignate the noſe proceed afterward to form the cheek; I am diſpleaſed when I examine thoſe of the forehead, and overwhelmed with aſtoniſhment when I behold one ſtiff courſe of lines employed to expreſs the chin."

Another of his moſt meritorious works is the portrait of Gaſper Charrier, after Blanchet, where, though the hair appears too briſtly for human hair, the face is moſt exquiſitely engraven, and the eyes have never been ſurpaſſed either for form, feeling, fire, or the animated humidity of the cryſtalline humour.

On the whole, that characteriſtic mark of genius which diſpoſes us to regard an artiſt rather by the dimenſions of his merit, than by his freedom from defects, belongs among engravers pre-eminently to Maſſon. His hiſtorical works, of which we ſhall next proceed to mention the moſt eſteemed, are few compared with his portraits, but are of the folio dimenſions.

"The Holy Family," from N. Mignard; "St. Jerome," and "Jeſus of Nazareth," the latter ſmall; "The Aſſumption of the Virgin," a large upright from Rubens, eſteemed one of the moſt rare and beautiful of the engravings of Maſſon, though it bears not his name. "The Brazen Serpent," after a grand compoſition of Le Brun, engraved on two plates on account of its large dimenſions, and the before-mentioned Jeſus Chriſt at the table of Emmaus, after Titian.

The portraits from the graver of Maſſon are ſome of them in large, and others in ſmall folio, and are principally as follows, beginning with the ſmaller.

Antoine Maſſon of the royal academy, engraver in ordinary to the king, ſe ipſe fecit; Frederic William elector of Brandenbourg, dated 1683, (a ſcarce print). Guy, or

Guido Patin, doctor of medicine at Paris 1670, extremely rare and in an extraordinary ftyle. Charles Patin, (fon of Guy) doctor of medicine; another of the chef d'œuvres of Maffon. Marin Caræus, phyfician to the king; after P. Mignard, dated 1665. François Marie, doge of the moft ferene republic of Geneva, 1685. Pierre Dupuis, painter to the king, N. Mignard pinx. 1663. Hardouin de Beaumont, archbifhop of Paris, N. Mignard pinx. 1664. Gafpar Charrier, fecretary to the king, Thomas Blanchet pinx. Emanuel Theodore de la Tour, of Auvergne, duke d'Albert, N. Mignard pinx. Alexander du Puy, marquis of St. Andre, De Seve pinx. Louis, duke de Vendome, P. Mignard pinx. Michael Colbert, abbé of Premontres, 1674, Maffon pinxit. William de Brifacier, fecretary to the benefices in the gift of the queen, N. Mignard pinx, 1664; a very capital engraving, commented upon in our biography of the artift. Olivier le Fevre d'Ormeffon, prefident of the parliament, 1668. Antoine Turgot de St. Clair, mafter of requefts, 1668. Marie de Lorraine, duchefs of Guife, N. Mignard pinx.

Portraits in very large folio. Anne of Auftria, queen of France, P. Mignard pinx. Maria Therefa of Auftria, queen of France, N. Mignard pinx. Maria Anne Victoire de Baviere, dauphinefs of France. Louis Augufte, duke of Maine, ad vivum fc. Jean Jacques de Mefmes, count d'Aveaux, 1683. François de Beauvilliers, duke of St. Aignau. François Rouxel de Medavi, archbifhop of Rouen, 1677. Jerome Bignon, librarian to the king, 1686. Denis Marin, fecretary to the king, 1672. Louis Verjus, count de Crecy, counfellor of ftate, 1679. Nicolas de Lamoignon, count de Courfon, 1676. Count of Harcourt, reprefented as far as the knees, a celebrated portrait, known under the name of "Cadet de la peree," N. Mignard Aveni pinx. Ant. Maffon fc. a mafterpiece of engraving.

In the following inftances the heads are of the natural fize; but on this immenfe fcale Maffon did not attain the fame perfection, as on a fmaller; his force being lavifhed and loft in unneceffary exertion. Louis XIV, in a hat, ad vivum fecit, 1687. Louis XIV., after le Brun; a large oval. Louis dauphin, fon of Louis XIV, in a hat. Jean Baptifte Colbert, minifter to the king, 1677. Francis de Harley, archbifhop of Paris, 1684. Claude du Houffet, chancellor to the king's brother, 1681. Henri de la Tour d'Auvergne, vifcount de Turenne. Francis Michael le Tellier, marquis de Louvois. Nicolas Potier de Novien, firft prefident of the parliament, 1679. William de Lamoignon, firft prefident of the parliament, 1675. Charles Colbert, marquis de Croiffi, H. Cafcar pinx. 1681.

Madeleine Maffon, the daughter of Antoine, was born at Paris about the year 1646. She was educated under her father, and engraved in the fame ftyle as himfelf. Her prints are much valued, and are equally rare as thofe of her father.

The following are a few of her moft diftinguifhed productions:

Elizabeth Charlotte, Palatine, Duchefs of Orleans, the head as large as life, and infcribed "Mad. Maffon fc. under the direction of her father," in folio. Elizabeth d'Orleans, Duchefs of Alencon. P. Mignard pinx. the fame fize. Maria Therefa of Auftria, queen of France and Navarre. Mad. Maffon fec. the fame fize. Elizabeth Maria Jofephine, Infanta. Id. fc. fame fize. Victor Amadee II. duke of Savoy, Mad. Maffon, fc. the fame fize. Louis-Henri de Gendrin de Montefpan, a portrait painted by her father, and engraven by Madeleine Maffon, of the fame fize as the above. The great number of thofe coloffal engravings that were performed about this period may be regarded as one of the fafhionable follies of an age when the *big* was too much miftaken for the *great*.

René Lochon was born at Poiffy about the year 1636. He fettled at Paris, where he publifhed a great number of portraits, as well as hiftorical fubjects after different mafters. His ftyle of engraving refembled that of Nanteuil, efpecially by its mellownefs, though his works are decidedly inferior to thofe of that great mafter. Thofe moft worthy of diftinction, are "Jefus Chrift bearing the Crofs," after Carracci, and a "Holy Family," after N. Coypel, dated 1668, both in folio.

The beft of his portraits are alfo in folio, and are thofe of, a young magiftrate in an octagonal border of oak leaves, infcribed R. Lochon ad vivum del. et fec. 1657. Charles de Bourbon, bifhop of Soiffons, Ib. 1657. Euftaches de Lepeville, bifhop of Conftance, 1661. Felix Vialart, bifhop of Chalon. Belthafar Phelipeaux de la Vrilliere, abbe; ad vivum fec. 1667. Jenome Bignon, a celebrated author of the laft century. R. Lochon ad vivum furtim del. et fc. Louis de Marillac, doctor of the Sorbonne, 1696. Paul the younger, of the company of Jefus. Harduin de Perefix, archbifhop of Paris, 1676, after Champagne. Antoine Arnauld, after the fame.

Jean Berain was born at Paris A.D. 1636 and died in the fame city in the year 1711. He has the title of ornamental defigner to the king, and fo great was the reputation he enjoyed, that he was conftantly employed, either for the court or city, in ornamental decorations. His brother Louis, who was alfo a fkilful defigner, affifted him in thefe works, and he was alfo occafionally affifted by Chaveau and Le Moine.

To his etchings he has not often fubfcribed his name; they are neat, but too ftiff and taftelefs to merit any other praife. His principal work is a large folio book, (of which the frontifpiece is by Scotin,) entitled "Ornamens du Peinture et de Sculpture, dans de Gallerie d'Apollon du Louvre, et dans le grand apartement du Roi aux Tuilleries."

His other works on copper are fourteen plates forming a fet of heraldic devices in 4to. three folio plates of ornaments, invented and executed by J. Berain; a comic fubject of a man leading two dogs; an opera ballet, and two plates of Maufolea.

Simon de la Roiffiere was born at Paris in 1637. He engraved not only after his own defigns, but alfo after thofe of Sebaftien le Clerc. He likewife executed medallions of the popes from Martin to Innocent XI. for the edition of P. Molinet canon of St. Genevieve, a work in folio, printed in 1679. Several of the plates in the work entitled "the Cabinet of the King," were alfo from the hand of this artift; whofe beft performances, on the whole, are, "The Death of a Prince furrounded by his Court;" frontifpiece and feveral vignettes for M. Blondel's grand courfe d'architecture. Some plates for Jean Picart's work on the dimenfions of the earth. Some plates for the work of Antoine Defgodets, entitled, "Traité des edifices antiques de Rome;" a fet of forty plates of antique medals in folio; "A View of the Palais Royal," in two plates, and a fet of twenty-fix plates of views, plans, elevations, &c. of the royal palaces, of which, however, Boiffiere engraved only a part.

Jacques Lubin was born at Paris in the year 1637. He was probably the difciple of G. Edelinck, whofe ftyle he fuccefsfully imitated. Lubin engraved a great number of portraits, and was employed, in conjunction with other able engravers, in executing the plates for Perault's memoirs of illuftrious men. His principal works are, the portraits of Armand Jean du Pleffis, Cardinal duke de Richelieu.

Jean

Jean Pierre Camus, bishop of Belley. Robert Arnauld d'Andilly, (a celebrated author.) Jean Paffire Maffon, (a celebrated advocate.) Vincent Voiture, of the French academy. Pierre Corneille, of the French academy. Olivier Patru, of the French academy, and Jean Baptifte Colbert, minifter of ftate, all in folio. The only hiftorical plate from his graver, with which we are acquainted, is alfo in folio, and its fubject "Jefus Chrift laid in the Sepulchre;" after le Sueur.

Simon Thomaffin was born at Troyes in Champagne in the year 1638, and was a defcendant of Philip Thomaffin, the tutor of Callot, who flourifhed at Rome toward the clofe of the fixteenth century. After acquiring the rudiments of drawing and engraving in his natal city, he repaired to Paris, and from thence to Rome, where he ftudied in the academy founded by the French king for the improvement of thofe young artifts who were fent from France. He afterwards returned to Paris, where he became a member of the Royal Academy, and where he died in the year 1722.

The ftyle of Thomaffin's engraving, which is performed with the graver alone, is neat and clear, but laboured and dry; his drawing is tolerably correct, but fomewhat mannered; he appears to have fuffered, rather than enjoyed, his various tafks, and to have poffeffed "patience under his fufferings."

His largeft work is a folio volume, containing two hundred and eighteen plates of the fculptures which adorn the chateau and gardens of Verfailles; and his beft hiftorical works are "The Miraculous Fifh of St. Peter," after Raphael. "The Reception of the Emperor," after Bon Boulogne, engraven in 1684. "St. Paul carried up into the third Heaven," a circle, engraven in 1684, after Pouffin. "Jefus on the Mount of Olives," after le Brun. "Sancta Scholaftica, cujus Anima de Corpore egreffa," after J. Jouvenal, all in folio; and the "Transfiguration," after Raphael, the largeft and beft of Thomaffin's hiftorical works, engraved on two plates.

The beft of his portraits, are thofe of Louis, duke de Bourgogne, fon of Louis dauphin, defigned and engraven by S. Thomaffin, 1698, in folio. Maria Adelaide of Savoy, Duchefs de Bourgogne. Id. del. et fc. Paul Beauvillier, duke de Aignon, peer of France. S. Thomaffin fc. 1695, in folio. Arnauld, cardinal d'Offat. S. Thomaffin fecit, fculptor Regius, in 4to. Charles XII. king of Sweden, S. Thomaffin fecit, 4to. Francis Hebert, bifhop of Agen; after du Mee, in folio. Antoine Furetiere, of the French academy. De Seve pinx. in folio. Pierre Corneille, of the French academy. C. le Brun pinx. in folio. Equeftrian ftatue of Louis XIV. in bronze, executed by Coyzevox, in folio, and a grand Thefé, with the portrait of Alexander Bournonville. S. Thomaffin del. et fc. on two folio plates.

Henri Simon Thomaffin was born at Paris in 1688, and died in the fame city in 1741. After having learned the principles of his art from his father, he ftudied under Picart, whom he accompanied to Holland. After a ftay of two years at Amfterdam he returned to Paris, and was nominated a member of the academy of painting in 1728. His ftyle of engraving being coarfe and diffonant, neither refembles that of his father Simon, nor that of Picart; neither is he at all fuperior to his father in his knowledge of the human figure.

His principal hiftorical works are in folio, and are entitled as follows: "Adam and Eve out of Paradife, or the Man condemned to Labour," after a painting of Dom. Feti, in the cabinet of Crozat. "Melancholy," a kneeling figure, meditating on a fcull, after the fame mafter, and from the fame collection. This print is one of the beft of his engravings, and ably executed. "The Pilgrims of Emmaus," after a painting of Paul Veronefe, in the collection of Crozat. "A Woman at the Bath, attended by two others, one of whom raifes her Robe, while the other wafhes her Feet," after Rubens, engraven by H. S. Thomaffin, under the direction of B. Picart. "The Magnificat, or the Canticle of the Virgin," from a celebrated painting by Jouvenet, in the choir of Notre Dame. "The Wrath of Coriolanus appeafed by the Tears of his Family," after la Foffe. "The Plague in the City of Marfeilles, during 1721," (with a defcription,) painted by J. Fr. de Troy. "Apollo diftributing Rewards to the Arts and Sciences, and Minerva crowning the Genius of France," a cieling piece painted by P. Mignard for the fmall apartments of the king at Verfailles. Sim. Thomaffin filius fculp. Amftel. "Nymphs furprifed by Satyrs," from L. Sylveftre. "A naked Venus afleep," from Le Brun. "Eneas and Achates entering the Temple where Dido is fitting," from Coypel, and the following fubjects from Watteau,

"The Return from a Ball," "Recruits marching to join their Regiment," a Buffoon (dedicated to count Caylus,) "Mezetin playing on the Guitar," a fet of twelve plates of fafhionable figures, by Thomaffin, Cochin and others; and another fet of eight, which are much fought after by connoiffeurs. Note, the two latter works are of the 8vo. fize.

The following portraits are alfo from the graver of the Junior Thomaffin:

Michal Angelo Caravaggio, reflected in a mirror, which is held by the painter, in 4to. Charles Cignani of Bologna, painted by himfelf. Jean Theery, fculptor in ordinary to the kings of France and Spain, after Largilliere. Cardinal Fleury, fupported by Diogenes; after Rigaud and Autreau. Louis, dauphin of France, after Jean Louis Tocqué; and a medallion of Louis XIV. prefented to the Arts by Minerva, after L. de Bologna, all in folio.

Sebaftian le Clerc was an artift of very fuperior powers. He was the fon of a celebrated goldfmith of Metz, in which city our engraver was born in the year 1637. He is faid to have been educated an engineer, but from an engraved view of his native city, which bears the date of 1650, and which therefore, if his biographers have truly recorded the year of his birth, muft have been engraven at the age of thirteen; and from an engraved head of Jefus Chrift, which is dated in the year 1655, it appears that his paffion for fine art manifefted itfelf at a very early period of his life; fo early, as may well incline us to doubt the fact of his having been educated an engineer, or to abforb it in the ftrong and unqueftionable evidence afforded by this early manifeftation of his genius for the art of engraving.

He learned the firft principles of drawing, and probably of mathematics, from his father, or under his paternal roof; and, befide the above mentioned head, executed feveral plates with the graver alone, before he became acquainted with that branch of the art in which he was deftined to hold fo diftinguifhed a rank.

He was probably unacquainted with etching until after his arrival in the French metropolis, which he vifited with the view of improving himfelf as an artift, and of affociating with the men of fcience with whofe prefence Paris was at that time adorned. Here he became acquainted, and finally formed a ftrict friendfhip with Le Brun, by whofe recommendation he difcontinued his architectural and engineering purfuits, and confined his attention to defigning and engraving; and here he was introduced, probably by Le Brun himfelf, to the minifter Colbert, who being made acquainted with

with his merits, obtained for him an apartment in the Gobelins and a penfion of eighteen hundred livres, which however was affigned to him upon condition of his working for the king alone, who honoured him with the title of engraver royal. He was foon after created profeffor of perfpective in the royal academy, and a Roman knight by pope Clement XI.

In the year 1672, he was appointed to engrave the Maufoleum, erected by the Royal Academy of Arts, in the church of l'Oratoire at Paris, under the direction of Le Brun, for which he received a penfion of three hundred livres from the academy, and the following year he married Charlotte Jeanne, daughter of Vanden Kirchove, the king's dyer at the Gobelins, by whom he had eighteen children.

It appears that the advantage of a royal penfion in France might, even at that time, be more feeming than real. The rapid increafe of his family, and a fecret confcioufnefs, probably, that his inventive talent was reftrained by his royal engagement, obliged le Clerc to give up that fettled upon him by the king, on account of the condition annexed to it. Anticipating that he fhould be more profitably patronized by the public, and feeling the vigorous expanfion of his own powers for original compofition, he now began that vaft number of engravings, from his own defigns, to which his name is annexed, and which amount to upward of three thoufand! many of which are peopled by prodigious multitudes, in all the diverfity of coftume of the various ages and nations of the earth.

Le Clerc died at Paris A.D. 1714, aged feventy-feven years, and was buried in the church of St. Hippolito, in which parifh he refided.

Perhaps no artift has difplayed a greater diverfity of endowment than Le Clerc. From his mathematical fcience, and the ftudies he connected therewith, he became an enlightened architect, engineer, and a teacher of perfpective; from his knowledge of drawing, his various reading, and his ftudy of the works of Le Brun and Callot; above all from the energy of his own genius, he became an accomplifhed defigner and engraver, excelling, to ufe the fentiments of a French writer, in almoft every department of fine art; hiftory, landfcapes, animals, ruined and modern edifices, were by turns the fubjects of his pencil and his graver. His compofitions are full of knowledge and variety, his draperies fimple and beautiful, his forms elegant and correct, his heads noble and characteriftic, while their expreffion is indicated with the addrefs of a confummate artift. He ftudied in the fchool of Le Brun, and if to fome he fhould rather appear to have ftudied Raphael and the antique, this proceeds from the learned manner of Le Brun when reduced to the fmall fcale of le Clerc's engravings; for, in confequence of fuch reduction, Le Brun lofes his own defects, and retains only the grand ftyle of the Roman fchool.

From thefe praifes of the French writers, Huber, Roft, and Bafan, fome fmall deductions fhould perhaps be made on the fcore of national partiality. In his engraving, Le Clerc generally employed fingle courfes of lines, and with more of the fpirit and firmnefs of Callot, than of the tafteful airinefs which charms us in the works of Della Bella.

Our limits allow us to mention but few, comparatively fpeaking, of his numerous works. We begin with thofe taken from *facred hiftory*.

"The Dream of the Prophet Elias." "The Apotheofis of the fame Prophet," wherein the landfcape is a view of the falls of Niagara, both in fmall folio. "The Repentance of the Ninevites." "The young Tobias with the Angel on the Banks of the Tigris," fmall folio. "The Calling of Abraham," in 4to. "The Annunciation," infcribed Virgini ab Angelo falutatæ. "The Adoration of the Kings," where a page is feen carrying a robe to one of them, a very fcarce print. "A Holy Family," where the Infant Jefus is feen between the Virgin and St. Jofeph, all three ftanding. "The Infant Jefus fitting, and before him the little St. John, who kiffes his Hand." "The Good Shepherd," as defcribed by the prophet Ifaiah. An allegory on the vifions of madame Guyon, a diftinguifhed piece in fmall folio. "St. John the Baptift fitting beneath a Rock." "The Miracle of the Loaves and Fifhes," one of the chef-d'œuvres of the artift, in fmall folio. "The Saviour fitting in the midft of ten Apoftles." "An Ecce Homo," accompanied with feveral foldiers. "A Crucifix on a ground of dark Clouds." "The Martyrdom of St. Stephen." "A ftanding Madonna, inclofed in a Border." "The Virgin borne on Clouds, and attended by Angels," a round piece. "The Virgin with Angels, feated with the Infant Jefus in a Landfcape." "Our Lady of mount Carmel." "The miraculous Image of our Lady of Confolation at Premy." "St. John the Evangelift writing in the Ifle of Patmos." "The Bark of St. Peter," infcribed Annuerant iis, qui erant, &c.

Subjects from profane Hiftory, ancient and modern.—"The entrance of Alexander into Babylon," a diftinguifhed piece in folio. In the firft proofs the hero is feen in profile, in the fubfequent impreffions it is a three-quarter face. "The Apotheofis of Ifis," in folio. In the firft proofs dancers are reprefented furrounding an altar, in the fubfequent impreffions their place is fupplied by facrificers. "Mars" and "Diana," a pair of fingle figures, in 8vo. extremely fcarce. "The Map of the Gobelins," a folio print in honour of Le Brun. "The Academy of Sciences," in the firft proofs of which the fkeleton of a ftag and tortoife are reprefented in the foreground; a capital piece. "The triumphal Arch of Louis XIV. at the Gate of St. Antoine," a capital piece, in folio. "The Chapel of St. Catherine at Stockholm," which contains the burial place of the kings of Sweden, improperly called the tomb of the king of Portugal, in folio, 1654. "Catafalque erected in the Church of Stockholm for the Obfequies of Charles XI. of Sweden," 1697, in folio. "Catafalque of Chancellor Seguier," a print in great requeft among connoiffeurs. A pair in folio of the cielings of the hall and bed-chamber of baron Teffin, in his hotel at Stockholm, much valued for their tafteful execution. "Proceffion of the Knights of the Order of the Holy Ghoft, on the Quay of St. Auguftin at Paris," in folio. "The Game Keeper of Nantes," a very remarkable piece, engraven in 1668, in folio; (a bad artift retouched this plate in 1694, and put upon it re-engraved by Carreau.) Allegory in praife of Louis XIV. reprefenting Hercules and Alexander with the motto: "Plures non capit orbes," 1684, in 4to. "Venus rifing from the Sea." A piece termed "la premiere Venus," and engraved for M. Potier, in 1693, in 4to. The fame piece called "la feconde Venus," re-engraven by le Clerc 1711, in the contrary direction. (After the death of le Clerc M. Eifen added to this plate a Triton, which pufhes the Chariot, and a Cupid flying before it.) "The Tomb of M. Bonneau in the church of Tournay," after Girardon, 1685. "Two Vafes of Flowers on one Plate, furrounded with an ornamental Border," 1656. "The Fortrefs of Montmelion," taken by M. de Catinat, the 21ft Dec. 1691, in folio.

The following are ufually bound in fets or feries.—Figures illuftrative of the paffion of our Saviour, in thirty-fix fmall plates. Reprefentation of the inftitution of the order of Mathurius for the redemption of captives, on eleven plates, including the frontifpiece, 1654. Another feries of prints for the order of Mathurius, eleven plates, 1656; fcarce. The

triumphs

triumphs of Charles IV. duke of Lorraine, on twenty-three plates, of which two are engraved by Dervet of Nancy, 1664, in folio. Hiſtory of Charles, duke of Lorraine, conſiſting of thirty-ſeven plates of hiſtorical ſubjects, and vignettes, in quarto. Twenty-eight plates for the Hiſtory of the Preſent State of the Ottoman Empire, by Briot, Paris 1670, in quarto. A collection of academic figures, in thirty-two plates, with the frontiſpiece, executed for the ſecond edition of "L'Art de Peinture, par Dufreſnoy," Paris, 1673, in 12mo. Ovid's Metamorphoſes, by Benſerade, thirty-nine plates, Paris, 1676, in quarto. The Labyrinth of Verſailles, containing thirty-nine plates of fables, with the frontiſpiece, Paris, 1677, in octavo, of which the firſt edition is now ſcarce. The Fables of Eſop, twenty-three pieces, in ovals. A collection of figures, horſes, landſcapes, &c. dedicated to the duke of Bourgogne, in nine books, including ſixty plates. Characters of the Paſſions, an elementary book after Le Brun, in twenty plates. Elements of Deſign, by Seb. le Clerc, in fifty-two plates. Treatiſe on Geometry, containing (beſides the figures engraven in wood, after Le Clerc, to the number of near three hundred,) eighteen copper-plates by himſelf, Paris, 1690, in octavo. Tapeſtries of the king, on which are repreſented the four Elements, and the four Seaſons, making, with the ornamental accompaniments, forty-eight plates, after Le Brun. The firſt edition is dated 1670, and is in imperial folio. "The Battles of Alexander," after Le Brun, ſix plates with the frontiſpiece, (which repreſents the gallery of the Gobelins,) in ſmall folio. "The Loves of Cupid and Pſyche," four plates, in folio. "The four Victories," repreſenting the ſurrender of Tournay, and that of Douay, the defeat of count de Marſan, and that of the Swiſs Confederacy, in folio. "The Conqueſts of the King," in twenty-eight plates, thirteen of which are engraven by Le Clerc; namely, The Iſle of Rez; Fort de Schenk; the Town of Nimeguen; City of de Grey; Battles of Sintzheim; of Fenette; Meſſina; Views of Agoſta, Bouchain; Battle of Agoſta; Battle of Palermo; L'Eſcalette; Battle of Caſſel; in folio: the other pieces of this collection were engraven by Chatillon, after the deſigns of Le Clerc. "The Leſſer Conqueſts of the King," in eight plates; namely, Views of Meſſina, and Dinant; the Battles of Caſſel, and St. Omer; Audience given to the Ambaſſador of Siam; Demolition of the temple of Charenton; the Combat of Leuze; the Blockade of Namur, in quarto.

Views and other Landſcapes.—"Side View of the City of Metz," engraven in 1650, the firſt eſſay of Le Clerc in the art of engraving. "The Remains of the Aqueduct of Joui, near Metz, and the village of Joui," a pair of landſcapes, engraven in 1656. "The Plan of the City of Metz," taken from the Siege of Metz, by Charles V. deſcribed by Saligna, 1665, in quarto. "A ſtrong Cheateau, built on Rocks in the middle of the Sea," from the hiſtory of the wars of Louis XIV. againſt the Dutch, in 1672. "A ſmall Landſcape," in which three Children are ſeen unrolling a printed Bill, 1620. Twelve views of the Fauxbourgs of Paris, dated 1695. A ſeries of views of gardens, perſpectives of cities, rocks, and ruins, dedicated to the marquis of Beringhen, twelve ſmall pieces, numbered. Thirty-ſeven plates of ſmall landſcapes and figures, deſigned and engraven for the inſtruction of the marquis of Courtenvaux, the two laſt of which are not always found in this collection. In the one is ſeen a cavalier turning his horſe; and in the other an arcade, 1690.

The beſt portraits by Le Clerc are, Sebaſtian Le Clerc ſtanding before a deſk, with ſeveral other figures, a piece entitled "Le Cabinet de M. le Clerc," not finiſhed. Small portrait of a Turk, dated 1656. Abraham Fabert, ſeigneur de Moulin, 1657. Marſhal de la Ferte, rare. Egonde Furſtenberg, biſhop of Straſbourg. Louis Fremin, ſcarce. A knight of Malta, 1659. "Vera Effigies R. P. Di. Philippi, Abbatis S. Agerici Virdunenſis," a whole length figure in a ſmall border, 1660. Torquato Taſſo, and M. Potier, "en medallion."

Louis de Chatillon was born at St. Menehould, in Champagne, in 1639, and died at Paris in 1734. Whoſe diſciple he was, Strutt could not find, nor have the French writers mentioned. He evidently imitated the free ſtyle of Girard Audran, and though he falls ſhort of that great maſter, his prints are not deſtitute of merit. Among the beſt of them may be reckoned, "The Woman taken in Adultery," after S. Bourdon. "The Converſion of St. Paul," after the ſame. "The Seven Sacraments," painted at Rome by Pouſſin for the Chevalier de Pozzo. "St. John in the Iſle of Patmos," after the ſame. "The Fates weaving the Deſtiny of Maria de Medicis," after Rubens, all in folio. He alſo engraved three books, two of which contain the fountains for the iron horſe at Verſailles, and the third for the pavilions of Marly.

Jaques Blondeau, or Blondel, was born at Langres A.D. 1639. He travelled to Rome for profeſſional improvement, and probably, judging from his ſtyle of engraving, ſtudied there under Cornelius Bloemart, in conjunction with whom, Spierre, Clouet, and ſome others, he engraved a work from the pictures of Pietro da Cortona, in the palace of Pitti at Florence. Blondeau worked, entirely with the graver, in a ſtyle reſembling that of Bloemart, but he by no means equalled that maſter, either in drawing or freedom of execution. His prints are comparatively cold and metallic, and the extremities of his figures heavy, and frequently incorrect.

Of the plates already mentioned from P. da Cortona, he engraved eight of mythological and allegorical ſubjects: they are in ſmall folio, and the few following engravings by this artiſt, (the beſt of his works,) are all of the folio ſize, "The Martyrdom of St. Lawrence," after the ſame painter. "The Chair of St. Peter," after Bernini. "A Magdalen," after Hyacinthe Calandrucci. "The Circumciſion," after Ciri Ferri. "Chriſt, with the two Maries and St. John at the Foot of the Croſs," after the ſame. "St. Auguſtin appearing to St. Thereſa," after the ſame.

Portraits.—Cardinal François Laurent Brancati, 1681. Cardinal Fortuna Caraffa, 1686. Cardinal Maximilian Gandolfi, archbiſhop of Salzburgh, 1686. Cardinal Opitius Pallavicini. General Eneas, count de Caprara. René d'Eſt, duke of Modena. Jean-George III. elector of Saxony, John Sobieſki, king of Poland. Cardinal Bichi, after Le Bourguignon, in an oval.

Charles Simonneau was born at Orleans in the year 1639, and died at Paris in 1728. He learned the principles of drawing from Noel Coypel, and the art of engraving in the ſchool of William Chateau. His firſt plates were executed with the graver only, in a ſtyle founded upon that of De Poilly; but he afterwards took up the point; and the prints which he produced by an union of both, are infinitely ſuperior to thoſe on which etching was not employed. He drew correctly, and his beſt plates, (which are as follow,) are finiſhed in a neat and pleaſing ſtyle; and are, with an exception or two which we ſhall mention, of the folio claſs.

"The Virgin kneeling, in a Landſcape, holding the infant Jeſus ſeated on the Fragment of a ruined Building, and before him the little St. John on his Knees," after a painting of Raffaelle in the Eſcurial. "Hagar in Deſpair comforted by an Angel," after Andrea Sacchi. "The Vir-

gin

gin kneeling, and holding the infant Jesus in her Arms, in the midst of a Concert of Angels," after a painting of Fra. Bartolomeo, in the cabinet of Crozat, almost square. "The infant Jesus sleeping in a Manger, and adored by the Shepherds," after Carracci. "Jesus Christ conversing with the Samaritan Woman." "Jesus Christ taken down from the Cross, and placed on the Knees of his Mother," and "The stoning of St. Stephen," are also after Carracci. "Jesus Christ at the House of Martha and Mary," after Dominichino. "The Passage of the Rhine by the French Army," after Vandermeulen. "The Voyage of Mary de Medicis to Pont-de-Le," after Rubens, for the Luxembourg gallery. "Winter," after the statue which Girardin executed in marble, for the gardens of Versailles. Seven plates containing different views of "The Tomb of Cardinal Richelieu, erected in the church of the Sorbonne. "Astronomy," an allegorical composition, after Michel Corneille, the son, an oval. "Venus bringing the Dictamnum to cure the Wound of Eneas," after Ch. de la Fosse.

The six following are after Le Brun, *viz.* "The Entrance of Jesus into Jerusalem." "The bearing of the Cross." "The Death of Hypolitus." "Hercules driving away the Stymphalides," an oval, in small folio. "Hercules striking the Hind with the brazen Feet," an upright. "The Conquest of Franche Comté, in 1674," a large allegorical engraving, with an arched top, and generally and justly esteemed the master-piece of Simonneau. "Lot with his Daughters," and "The Nativity," are both after Noel Coypel, and the three following are after Anthony Coypel: "Christ disputing among the Doctors," the original of which is in the cathedral of Notre Dame. An "Ecce Homo," and "The Triumph of Galatea." The two latter plates are etched by the painter, and finished with the graver by Simonneau.

The following folio portraits by this artist have also considerable merit: Henrietta Maria, queen of Charles I. of England, after Vanderwerf. Charlotte Elizabeth, duchess dowager of Orleans, after Rigaud. Julius Hardouin Mansert, architect to the king, after Fr. de Troy. Charles François de Lomenie, of Brienne, bishop of Coutances, after Dumee. Antoin François Ferrand, master of requests, after De Launay. Louis XIV., according to different painters, and at different periods of his life, a string of medallions attached to a palm-tree. He also engraved two or three plates of the sickening, or ridiculously refined, court flattery of Ant. Coypel, with portraits of the king, and Colbert d'Ormoy, *superintendant* of the arts.

Simonneau had a son, Philip, whom he brought up to the profession of engraving. His style was similar, but his talents inferior to those of his father, and he engraved but few plates.

Two large friezes, the one representing "The Rape of the Sabines," the other, "The Peace between the Romans and the Sabines," after Julio Romano. "The Three Goddesses preparing for the Judgment of Paris," after Perin del Vaga, in folio. "Venus and Adonis," after Albano, and two plates for the Crozat collection, are all that are known of the works of Philip Simonneau.

Louis Simonneau, younger brother of Charles, was born at Orleans in 1656, and died at Paris in 1728. He seems to have taken as a model the works of Audran; and by combining the etching-needle with the graver, he has imparted an agreeable variety to his works. He drew with great correctness, as is more particularly observable in the extremities of his figures. Like his elder brother, he was a member of the Academy, and in respect to talents, was scarcely his inferior. The best historical works of Louis Simonneau are as follow, beginning with those after Ant. Dieu, which are of the folio class: "The Bearing of the Cross." "Jesus Christ nailed to the Cross." "Jesus Christ dead on the Cross." These three plates constitute part of a series of twelve, the rest of which are engraven by J. Audran. "St. Catherine." "The Assumption of the Virgin," after the cieling painted by Le Brun in the seminary of St. Sulpice. Those which follow are after the same master, and are also in folio. "The Four Times of the Day." "The Four Seasons," on the cieling of the Chateau de Vaux le Vicomte. "The Cieling of the Pavilion of Aurora, in the Gardens of Sceaux," in four plates, and "The Nymph of Sceaux." "Susanna at the Bath surprised by the Elders," after Ant. Coypel, and "Jesus at the House of Martha and Mary," both in folio, after Ant. Coypel.

The best portraits by this artist are those of Hyacinthe Serroni, first archbishop of Albi, in quarto. Antoine Arnauld, a celebrated theologian, after Ph. D. Champagne, in folio. Antoine le Maitre, advocate of the parliament, after the same. Martin Charmois, counsellor of state, director of the royal academy of painting and sculpture, after Seb. Bourdon, 1706, in folio.

Nicholas de Larmessin, the father, was born at Paris about 1640. Very little is known respecting the life of this artist, except that he engraved a great number of portraits of the illustrious men of France, and other countries. His style of engraving was far from disagreeable, and he may justly be classed with the best engravers of the second rank. The graver was the sole instrument of his art, and he sometimes marked his plates with the monogram which will be found in our plate of those of the French school. His best portraits are those of Philippe de Bourbon, duke d'Orleans, brother of Louis XIV. Henrietta Stuard, duchess d'Orleans, consort of Philippe. Charles XI. of Sweden. Henry-Julius de Bourbon, duke d'Enguien. Godefroy, count d'Estrade, marshal of France. Gabriel Nicolas de la Reynie. Claude Felicite of Austria, consort of the emperor Leopold I. Louisa-Frances, duchess de la Valliere, in the dress of a carmelite nun. These are all of the quarto class; the following are in folio; Maximilian-Henry, archbishop of Cologne. Balthasar Moretus. Paul Manuce, a learned Italian. Laurent Coster de Harlem, the pretended inventor of printing. Jean Guttemberg de Mayence, the real inventor of printing. The last is engraved without any cross-hatchings, in the manner of Mellan.

Nicholas de Larmessin, the son, was born at Paris in 1684, and died in the same city in 1755, with the title of engraver to the king. He was the pupil of his father, and early displayed the greatest industry in engraving portraits as well as historical subjects. This artist had acquired great reputation for the prints he had executed for the collection of Crozat, but afterwards, borne away by the torrent of fashion, he only employed himself in engraving such works as those of Watteau, Lancret, Boucher, &c. His style of engraving, which consisted partly of etching, but chiefly of the work of the graver, possessed firmness and solidity, but his drawing was not correct.

The celebrated Schmidt of Berlin was the pupil of Larmessin, and engraved several subjects after Lancret, which are marked with the name of his master. The prints bearing the name of Schmidt are extremely scarce.

Larmessin's best engravings are those which were done, chiefly after Raphael, for the Crozat collection, and which are entitled as follow:

Portraits of Raphael, with that of Pontormo. Cardinal Pole, with a long beard, seated in an arm-chair, from a picture attributed by some to Raphael, and by others to Sebastian

baftian del Piombo. Frederic Carondelet, archdeacon of Bitento; this plate was engraven from a drawing in the poffeffion of M. de Crozat, which was copied from a picture in the poffeffion of the duke of Grafton, and the plate was afterwards worked upon in England, (prefumptively after the original picture,) by fir N. Dorigny. "St. Michael overcoming the Devil." Another of the fame fubject, differently treated. "St. George encountering the Dragon." "St. John the Evangelift." "The Holy Family." "The Madonna with the Infant Chrift afleep on her Lap." "Chrift bearing his Crofs," a very large print, from a very celebrated picture of this mafter, and "The Vifion of Ezekiel," a middle-fized, upright folio. The portrait of Adam de Vignancourt, grand mafter of Malta, after Michael Angelo du Carravaggio; and that of a comedian in the fervice of the duke of Mantua, after Dominico Feti, were alfo engraven for the Crozat collection.

The beft of our artift's engravings after French painters are of the folio clafs, and are entitled "Louis XIV. conferring the Blue Ribbon on the Duke de Bourgogne, Father of Louis XV., from a Picture in the Cabinet of M. Julienne." "Cythereæ Infulæ," and "Pagi Sponfa," after Watteau.

After Lancret he has engraven, "A Village Coquette." "The Play of Ball-leap." "The Gafcon punifhed." A fet of four plates of "The Four Ages of Man," characterized by the amufements proper for each period; and "The Four Seafons," characterized by the occupations proper for each feafon.

The beft of his prints after Boucher, are, A monument to the memory of John Tillotfon. "The River Scamander." "The Amourous Courtezan." "A Nobleman," and "The Calendar of old Men," the four latter taken from the tales of Fontaine.

The portraits by this artift, which are held in moft efteem, are thofe of Guillaume Couftou, fculptor in ordinary to the king, painted by Jean de Lien, and engraven by N. Larmeffin the fon, for his reception into the academy in 1730. Claude Hallé, painter to the king, painted by Le Gros, another reception piece. Philippe Vleughel, a Flemifh painter, painted by Ch. de Champagne. Louis XV. on horfeback, after J. B. Vanloo and C. Parrocel. Louis XV. on foot, after J. B. Vanloo, and C. de Parrocel. Maria Leizincka, confort of Louis XV. after the fame. Maria-Jofephine of Saxony, dauphinefs of France, after the fame. Charles-Henri de Lorraine, after Ranc. Woldemar de Lowendal, marfhal of France, after Boucher. Mademoifelle Sallé dancing, after Lancret, all in folio.

M. G. Tournier was born at Touloufe about the year 1640. He was the difciple of Moife Valentin, and painted feveral fubjects for the churches of his native city.

He etched feveral landfcapes after Salvator Rofa, fome Madonnas after Guido, a few trophies after Polidore de Carravaggio, and feveral vafes after Charles Errard. Strutt has confounded this artift with Robert Tourniere, who was a fkilful portrait painter, and a native of Caen.

Jaques Grignon was born in France, but in what part is uncertain, fometime in the year 1640, or thereabout, and flourifhed till toward the clofe of the century. The greater number, and beft executed, of his engravings, are portraits, which are entirely the work of the graver, and are efteemed for clearnefs, neatnefs, and truth of reprefentation. His hiftorical fubjects being dark, heavy, without much effect, and incorrectly drawn, are lefs worthy of notice.

The beft portraits by Grignon are thofe of François-Marie Rhima, an ecclefiaftic, in fmall folio, and of the oval form. Pierre Barbareau, doctor in theology, after Champagne. Jacques Caur, feigneur de St. Fargeau, fuperintendant of the finances under Charles VII., in 1450. Jehan Bureau, a powerful nobleman, chevalier and mayor of Bourdeaux, chamberlain to Charles VII. and Louis XI., and mafter of the French artillery, all in folio.

Grignon alfo engraved feveral plates for a work in fmall folio, entitled, "Les Tableaux de la Penitence," after the defigns of Chauveau.

Charles de la Haye was born at Fontainebleau in 1641. He vifited Italy when he was very young, refided there a confiderable time, and in conjunction with Bloemaert, Spierre, Blondeau, and others, engraved the paintings of Pietro da Cortona, in the Pitti palace at Florence. His ftyle of engraving fomewhat refembles that of Bloemart. His crofs-hatchings are thrown nearly at right angles over his firft courfes of lines in a manner at which modern tafte revolts; and his chiaro-fcuro is deficient in harmony; but his drawing of the naked is tolerably correct, which is certainly a cardinal requifite, more efpecially in engraving after the mafters of the Italian fchools.

The beft engravings of de la Haye are of the folio clafs, and their fubjects

"The Virgin with the infant Jefus on her Knees, who is diftributing Palms to St. Catherine and other holy Martyrs," after Ciro Ferri. "The Virgin and Child appearing to St. Philip Neri," a large upright, after the fame mafter. "Coriolanus refufing to fee the Roman Ambaffadors, on being exiled from Rome," after the fame. "The Grecian Philofophers converfing in the Garden of Academus," J. F. Romanelli pinx., a fine plate, and probably his very beft performance.

Jean Dolivan was born at Saragoffa in 1641. He fettled at Paris, and was chiefly employed in engraving ornaments, and decorations of various kinds. His prints may be claffed with thofe of Chauveau and le Pautre; but he had a lefs fertile genius than the latter. He engraved feveral works in conjunction with different artifts, and among others, the feries termed, the little Conquefts of Louis XIV. fome of the plates for Berain's ornaments of the royal tapeftries, one of the cielings for Perault's cabinet des Beaux Artes. "The Strangling of the Grand Vizier." "Funeral Decorations of the Chapel of Condé, at the Houfe of the Jefuits." "Subject of Grief for the Divine Service at the Chapel of Condé." "Maufoleum for the Funeral Obfequies of Maria de Guife d'Orleans, Queen of Spain, in 1695," all in folio, and after Berain.

Gerard Scotin was born at Goneffe, near Paris, in 1642, and flourifhed towards the end of the feventeenth century. He was the pupil of François Poilly, and handled the graver with much neatnefs; but his execution was not equally mellow with that of his mafter, nor was his drawing of the naked equally correct.

Of Gerard Scotin, the younger, who vifited England, and was a fuperior artift to his father, we have fpoken in our account of the *Origin and Progrefs of* ENGLISH *Engraving*.

The beft works of Gerard Scotin the elder, are of the folio clafs, and their fubjects, "The Marriage of St. Catherine," after Alex. Veronefe. "The Magdalen receiving Communion from Angels," after Dominichino. "A rural Life," after Dominico Feti, an upright. "The Circumcifion," infcribed "Vocatum eft Jefus," after P. Mignard. "The Baptifm of Jefus Chrift," infcribed "hic eft filius," after the fame painter. "Prefentation of the Infant Jefus in the Temple," after Ch. le Brun. (B. Audran has engraven the fame fubject.) "Monumentum marmoreum Caftellanorum," after the marble of Girardon. "The Siege of Courtray,"

tray," after Vandermeulen, the landfcape of which is engraven by Baudouin, the figures by Scotin.

François Spierre was born at Nancy in the year 1643. He ftudied at Paris, in the fchool of F. de Poilly, and foon attained a fuperiority even over that able mafter. He was a man of a philofophical turn of mind, great profeffional induftry, and extraordinary talent in his art. From Paris he travelled to Italy, in queft of further improvement, where he remained a confiderable time, and where his beft works were performed. On his return from Italy he was taken ill at Marfeilles, and died there at the early age of thirty-three, according to Strutt, though, according to the French writers, he was thirty-eight, to the great regret of all who poffeffed the leaft tafte for the art of engraving.

His beft works are held in great requeft among connoiffeurs, and are worthy of great praife. Strutt fays of him very truly, that he did not imitate the ftyle of his tutor, though he worked entirely with the graver, which inftrument he handled with great facility. He gave more play to the ftrokes, and produced an effect more foft and picturefque. But his ftyle was fo various upon different occafions, that we may add the fubftance of what Watelet has faid of him, without overcharging the profeffional character of our artift.

When he arrived at Rome, he found Cornelius Bloemart, whofe ftyle he occafionally imitated, in the full vigour of his powers, and the meridian of his reputation. But Bloemart and de Poilly each confined himfelf to one ftyle, whereas Spierre could vary his at pleafure ; he fometimes employed only a fingle courfe of lines, which he managed with a degree of eafe and freedom, fuperior to that of Mellan, fo that he may be faid to have beaten three of the greateft hiftorical engravers of the age, each at his own weapons. Sometimes the connoiffeur is furprifed by the boldnefs and grandeur of his execution, and at others charmed with its delicacy and fweetnefs ; and he has an occafional playfulnefs which may vie with that of etching, even from the hand of a mafter. Yet the prefent writer has feen prints from the graver of Spierre, or at leaft infcribed with his name, that are by no means worthy of thefe encomiums.

His abilities were not confined to engraving. He fometimes painted hiftory and allegory in a ftyle which appears formed upon that of Pietro da Cortona, and fometimes portraits. His portrait of count Laurent de Marfciano, which he engraved from a picture by himfelf, is remarkable for its harmonized variety of tints, though no part of the print be pufhed to the degree of blacknefs which has often been deemed indifpenfable to a vigorous chiaro-fcuro.

Confidering the fhort period of his life, his engravings are not few, and not many lives have been more completely filled with various and meritorious exertion. We begin our detail of the fubjects of his plates, with thofe which he engraved, after the pictures of the celebrated Italian mafters.

"The Virgin fuckling the Infant Saviour," a circle, or fhort oval, after Correggio. The earlieft, and moft rare proofs of this admirable engraving, are taken before drapery was introduced to cover the nudity of the infant, and are alfo without certain fmall trees which are feen in the fubfequent impreffions to the left of the virgin ; and thefe are fo valuable, that at the fale of M. Mariette, one of them brought five hundred livres.

"St. Michael encountering the Dragon," (a frontifpiece to the Roman Miffal ;) this with the four following are all in folio, and all after Pietro da Cortona. "The miraculous Conception," engraved for the Miffal of pope Alexander VII. "St. Martin before the Virgin, and the Infant Jefus, who holds a Lily in one Hand, and in the other a Palm." "The Architect of Alexander VIII. prefenting to that Pope a Plan of Mount Athos, with his propofed Improvements." "Cyrus refufing to fee Panthea, (his Captive,)" after a painting in the Pitti palace at Florence.

After Ciro-Ferri, Spierre has engraven the four following fubjects, in folio. "The Circumcifion," for the Miffal of pope Alexander VII. "Pallas in the Clouds, in a Chariot drawn by a Lion and a Lionefs, with Jupiter on high, and a Philofopher below." "A bird-hunting during Harveft," and "The Innocence of Crifpe."

And from the pictures of Bernini, "A Madonna with her Hands croffed," a circle in 4to. "St. John preaching in the Defart." "The Miracle of the Loaves and Fifhes." "Chrift on the Crofs, fufpended over a Sea of Blood," which feems to have flowed from his own wounds; a fingular performance executed without any crofs hatchings, the firft impreffions of which are diftinguifhed by having been printed before certain heads of cherubs were introduced ; and "The Chain of St. Peter," (a large print engraved on two plates.) Thefe are all of the folio clafs, and the following are either painted from nature, or invented by Spierre himfelf.

Innocent XI. Odefcalchi, fovereign Pontiff, in 4to. The Grand duke of Tufcany, engraven in 1659, in folio. Laurent count de Marfciano, in folio, a capital plate, of which we have already fpoken. Medallion of Alexander VII. borne high in the air by a genius, while underneath is feen a Hercules entering the gardens of the Hefperides, and the three daughters of Hefperus prefenting him with oranges. An allegory on the culture of orange-trees, under the pontificate of that pope, in folio. "Mars and Minerva prefiding over the Culture of Rofes," with which three nymphs are occupied. "An Allegory on the Faculties of the foul," in folio, a diftinguifhed piece of our artift, and, which ferves to fhew his philofophical turn of mind.

Jean Louis Roullet was born at Arles, in Provence, in the year 1643, and died at Paris in 1699. He learned the firft principles of drawing and engraving from Jean L'enfant, and completed his ftudies in the fchool of F de Poilly, whofe manner of engraving he adopted with great fuccefs. Quitting the fchool of de Poilly, he went to Italy, where he remained ten years, and where his merit recommended him to the favourable notice of Ciro-Ferri, and other celebrated artifts, to whom he was alfo endeared by his amiable perfonal qualities.

Roullet handled the graver with great freedom and facility, and drew the human figure correctly; he therefore ranks high among the engravers of France. His large print of the three Maries at the fepulchre, after A. Carracci, which according to Florent le Compte he engraved during his refidence at Naples, is much admired for correctnefs of outline, force of chiaro-fcuro, beauty of engraving, and the accuracy with which the expreffion of the original is transfufed. The fubjects of his other productions are as follow, beginning with the hiftorical:

A piece named "St. Claire." Here the infant Jefus is feen on the knees of his mother, placing his right hand on the tabernacle, accompanied by St. Jofeph, after Aug. Carracci. (Several artifts have engraven from the fame picture.)

"The Virgin holding the Infant Jefus, and a Book," after the fame. "The Madonna, and Infant Jefus, who embraces his Mother," after J. Lanfranc. Two of the angles of the dome of the church of the Jefuits at Naples, on which are reprefented the Evangelifts, St. Matthew, and St. Luke ; the two others, St. Mark and St. John, are engraven by Fr. Louvemont, after J. Lanfranc. "A Nun receiving a Buckler from Heaven," dedicated to the bifhop of Paderborn, with his portrait. Ciro Ferri inv. "Jupiter ordering the Shield of Perfeus to be forged," dedicated to the

the emperor Leopold, a large fubject executed by the fame artifts, in two plates. "Hercules prefenting to Jupiter the Monfters whom he had overcome," dedicated to pope Innocent XI. a fubject executed by the fame artifts, engraven at Rome in 1678. "Perfeus cutting off the Head of Medufa," and "Perfeus flaying the Sea Monfter," two plates in fmall folio. "The Vifitation of St. Elizabeth," dedicated to the dauphinefs, after P. Mignard. "The Virgin with the Infant Jefus in her Arms, who holds a Bunch of Grapes," a piece known under the name of "la Vierge au Raifin," dedicated to Madame de Maintenon, after the fame. The above are all in folio. "David prefenting the Head and Sword of Goliah to Saul," after Jof. Parrocel, in 4to.

The beft portraits by Roullet, are thofe of Francis de Poilly, engraver to the king, infcribed Fr. de Poilly ad vivum del. 1699, in fmall folio. Catherine Touchelle, wife of Hilaire Clement, procureur to the parliament, after Cotelle. Afcanius Philamarinus, cardinal archbifhop of Naples, Fr. de Marcu pinx. J. L. Roullet del. et fc. Neapoli. "Jacques-Louis, marquis of Beringhen, firft equerry to the king, after P. Mignard, in folio. Jean-Baptifte Lully, fecretary to the king, &c. after P. Mignard. Jean-Chaillon de Thoify, doctor of the Sorbonne, after C. Gerardin. Edward Colbert Cher, marquis Villacerf, fuperintendant of buildings, &c. by J. L. Roullet of Arles, 1698, an able engraving in imitation of bas relief. Camille le Tellier de Louvais, abbot of Bourdeaux, librarian to the king, after Nic. de Largilliere. Louis XIV. in regimentals, a three-quarter figure, after the fame, all in folio.

Benoit Frajat was born at Lyons in 1646. He learned the elements of his art under Guillaume Chateau, whom he accompanied into Italy, and whom he very foon furpaffed in the mellownefs, neatnefs, and freedom of his engravings, though not in other refpects.

Having fettled at Rome, Frajat efpoufed the daughter of the celebrated landfcape painter François Grimaldi, better known by the appellation of the Bolognefe. He engraved, after the moft celebrated Italian mafters, a great number of plates, among which the following, which are of the folio clafs, are held in moft efteem.

"The Holy Family," after Albano, one of his earlier engravings, done under the direction of Chateau. Another "Holy Family," after Pietro da Cortona. St. John is here prefenting a crofs to the infant Saviour. "The Marriage, or the Coronation of St. Catharine," after Aug. Carracci, a large plate of the upright form. "The Holy Family," and "The Temptation of St. Anthony," both after Annibal Caracci. "The Death of St. Jerome," from Dominichino, another large upright. "St. Francis Xavier expiring, contemplated by Groups of Angels in the Clouds," after J. B. Gaulli. "Our Saviour baptized in the Waters of Jordan," after Carlo Maratti. "St. Bridget fitting in the Clouds, triumphant over Envy, and venerated by Sages," after B. Lutti, engraven in 1707. "The Courfe of Atalanta," after P. Luccatelli.

The beft portraits by this artift are alfo in folio, and are thofe of Cardinal Frederic Coccia; Cardinal Cornaro; Cardinal Thomas Ferrari; Dom Cœleftinus, cardinal Sfrondatus, all after the pictures of L. David.

The biography of the family of the Bonnarts is in a confufed ftate in all the books that we have confulted, which, as they were mere men of mediocrity, will probably be the lefs regretted. It would appear that the brothers Robert and Nicholas were born at Paris about the middle of the 16th century, and perhaps alfo John Bonnart the elder, who engraved figures a-la-mode, and Italian comedians a-la-grotefque, with fifty-fix plates of the coftume of the different nations of the earth, all in folio, and after his own defigns.

He who figns his name Joan Bonnart, jun. is fuppofed to have been the fon of the former, and by him there is a fpirited and free etching of a cieling adorned with poetical fubjects, and publifhed in Perault's Cabinet des Beaux Artes.

The beft works of Robert and Nicholas are as follow, all of them being of the folio clafs:

Portrait of Louis XIV., Robert Bonnart fecit. Portrait of Louis, Dauphin, fon of Louis XIV. Idem fec. "Valenciennes taken by Affault, and faved from Pillage by the Clemency of the King, 1677," after F. Vandermeulen, engraven by R. Bonnart. "The King taking Poffeffion of the Citadel, after the Capture of Cambray, 1677," "Arrival of the King before Douay, which he caufes to be invefted by his Cavalry," Id. fc. "Entrance of the Queen into the City of Arras," Id. fc. in two plates, all after Vandermeulen, and engraved in a coarfe ftyle.

Pierre Giffart is another mediocre artift, who, however, fubfcribes himfelf Sculptor Regius. He was born in Paris in the year 1648, and died there in 1723. What talent he poffeffed was chiefly exercifed on portraits, medals, and ornaments, among which the following are held in moft efteem:

Marie-Anne Victoire of Bavaria, dauphinefs of France; below is reprefented the birth of the duke de Bourgogne, in folio. Frances d'Aubigné, marchionefs de Montefpan; executed by P. Giffart, engraver to the king, in folio. Philippe I. fon of Thomas XIII. count of Savoy. J. D. Lange del. P. Giffart Sculptor Regius, Parifiis, in fmall folio. Odoard, fon of Amadeus XV. count of Savoy. Id. del. id. fc. Aymon, fon of Amadeus XVI. count of Savoy. Id. del. id. fc. Louis, fon of Amadeus VIII. fecond duke of Savoy. Id. del. id. fc. all of the fame fmall folio fize. Collection of medals of the princes of the Lower Empire. Series of friezes, of cornices, tapeftries for an altar, and three chandeliers; five plates engraven by Giffart and Dolivart, after Berain, in folio. Frontifpiece for the introduction to P. Violier's Geography, after S. Le Clerc, in quarto. Frontifpiece to the Critical Hiftory of Superftitious Practices, after the fame.

Of the family of Parrocel much more may with juftice be faid; for both as painters and engravers they have fome claims to be confidered as men of genius. Jofeph was born at Brignolis, in Provence, in the year 1648, and died at Paris in 1704. He vifited Rome, and ftudied there under Bourguignon the battle painter, with whom he formed an intimate friendfhip. He was remarkable for the energy and expreffion of courage which he imparted to his warriors, and has been heard to obferve of thofe of Vandermeulen "ne favoit pas tuer fon homme."

The following etchings of Jof. Parrocel are from his own compofitions: they are of the quarto fize, and are believed to include the whole of his works on copper:

A fet of four plates of the four times of the day, *viz.* "Aurora, or the Camp;" "Mid-day, or the Halt;" "Evening, or the Battle;" "Night, the Field of Battle." A feries of forty-eight plates from the life of Chrift, and four other battle pieces.

Charles Parrocel, the fon of Jofeph, was born at Paris A.D. 1689, and died in the fame city in 1752. He dedicated his attention to the fame fpecies of art in which his father excelled, by whom he was inftructed, and whom he had the misfortune to lofe at the age of fixteen: he was then

then placed under the tuition of La Foſſe, after which he viſited Italy, and remained there ſeveral years.

On his return to his native country with the reputation of an excellent painter of battles, he was attached to the French cavalry, in order that he might enjoy the beſt opportunities of ſtudying ſuch military ſubjects as occurred; and he was alſo ſelected to paint the conqueſts of Louis XV.

He handled both the graver and etching-needle with facility; yet his works are on the whole inferior to thoſe of his father. A ſeries of plates of cavalry and infantry, after his own deſigns, are executed with conſiderable ſpirit.

Etienne Parrocel was the nephew of Charles, and was born in Paris ſomewhere about the year 1720. He alſo painted, etched, and handled the graver. The following ſubjects from his hand are executed in a bold and free ſtyle.

"The Triumph of Mordecai," after J. F. de Troy. "The Triumph of Bacchus and Ariadne," after P. Subleyras, both large folios. A bacchanalian ſubject in quarto, from a compoſition of his own.

Elizabeth Sophie Cheron, (ſubſequently Madame le Hay,) a lady celebrated for the extenſiveneſs of her acquirements and her talents in the fine arts, was born in the year 1648, and was the daughter of Henry Cheron, an enamel painter of Paris, under whoſe inſtruction ſhe made rapid progreſs in the arts of deſign. She was patronized by Le Brun, and received with flattering diſtinction by the Royal Academy, in the year 1676. At the age of ſixty ſhe married M. le Hay of the royal engineers, and died in her native city at the age of ſixty-three.

The preſent writer has not ſeen her engravings, and from the vague manner in which they are ſpoken of by her French biographers, cannot be certain whether the three following ſubjects are copied from antique gems, or deſigned by Madam Cheron with the view to their being engraved on gems, but moſt probably the former. They were, however, etched by herſelf, of the quarto ſize. "Bacchus and Ariadne;" "Mars and Venus;" and "Night ſhedding her Poppies."

She alſo engraved a "Deſcent from the Croſs," in folio, from a model by the abbé Zumbo. The plate is etched, and afterward finiſhed with the graver in a ſtyle that does credit to the powers of the artiſt.

Her remaining prints are a group of ſaints after Raphael, and a drawing-book containing thirty-ſix plates from deſigns of her own.

Louis Cheron, born at Paris in the year 1660, was brother to Elizabeth Sophia. He went to Italy, and remained there eighteen years, partly ſupported by the bounty of his ſiſter. He compoſed with facility, and drew rather correctly than gracefully. In his religious principles he was a Calviniſt, and the perſecutions of that ſect, which took place ſoon after his return to his native country, obliged him to ſeek refuge in England, where he was employed by the duke of Montague, and where he died at the age of fifty-three.

The following prints from his hand diſplay taſte and ability: they are of the folio ſize, and from his own compoſitions.

"St. Peter healing the lame Man at the Gate of the Temple;" "The Death of Ananias and Sapphira;" "St. Philip baptizing the Eunuch of Queen Candace;" and "Hercules reſting from his Labours." We ſhould not omit twenty-three plates which he engraved for his ſiſter's French verſion of the pſalms of David.

Nicolas Habert was born at Paris about 1650. He engraved almoſt conſtantly for the bookſellers, beſides executing a great number of portraits of French men of letters and other celebrated characters of the laſt century. Habert was tolerably well inſtructed in the mechaniſm of his art, which is all the praiſe which can in juſtice be awarded him. The beſt of his engravings are the following portraits.

Louis Maimbourg, a celebrated Jeſuit and author, engraven after life by N. Habert, 1686. Jean Baptiſte Santeuil, canon of St. Victor, 1686. Corneille Janſénius, biſhop of Ipre, doctor in theology at Louvain, after Champagne. Felix Vialart, biſhop of Chalons. Maria Louiſa of Orleans, daughter of Monſieur, queen of Spain. John Milton, the celebrated Engliſh poet. Thomas Parr, a celebrated Engliſh centenarian, all in folio.

Jean and Louis Creſpy, or Crepy, father and ſon, were both born in Paris, the former about the middle of the ſeventeenth century, the latter in the year 1680. Strutt ſpeaks of their abilities rather worſe than they deſerve, though neither of them merit much praiſe, nor other notice from us than the taſk of mentioning their principal works, which are as follow, and which, excepting their portraits, are of the folio claſs.

"Mary Magdalen," Crepy inv. et fecit. "The Manger," here the Infant Jeſus is ſeen ſleeping on ſtraw, and adored by two angels, after Albano. This is a print of ſome merit, and probably the beſt work of the elder Crepy. "The Deſcent from the Croſs," after Carlo Cignani. "A Holy Family, or St. Benedicite," after le Brun. "The Preſentation of the Infant Jeſus in the Temple," after the ſame, in ſmall folio. "The Rehearſer of amatory Speeches," after Watteau, engraven by Crepy the ſon, in folio.

The following portraits are alſo by theſe *artizans*, for artiſts they may ſcarcely be called, and are neatly finiſhed. Maria-Adelaide, princeſs of Piedmont, oval, in 4to. The chancellor d'Agueſſeau, in 4to. R. P. Allizi, oval, in 4to. The biſhop of Caillebot, 4to. Mahomet Effendi, ambaſſador to France, in 8vo. Antoine Houdart de la Motte, in 8vo. Antoine Watteau, in 8vo. The duke of Marlborough, in 8vo.

From the inſipidity of Habert and the Crepys, attention rebounds to the noble daring of Raymond la Fage. He was born at Thouloufe, or according to ſome writers at Liſle in the Abigeois, in the year 1654. Strutt does not often riſe to the tone of energy with which he writes of this man of genius, and we therefore heſitate not to adopt his words in preference to our own, or the tame prolixity of Huber and Roſt. La Fage "never had any maſter, but following the dictates of his own genius applied himſelf to drawing; and his works ſufficiently teſtify the ſurprizing progreſs he made in that art. His drawings are compoſitions of his own, chiefly outlines and ſlight ſketches made with a pen, but executed in a moſt maſterly ſtyle. The actions of his figures are ſpirited, bold, graceful, or elegant, as the ſubject required. His groups are finely contraſted; and frequently, without the aſſiſtance of ſhadow, he has contrived to detach them from each other, in ſuch a manner that the ſubject is by no means confuſed, or the effect diſagreeable. Certainly no man ever poſſeſſed greater fertility of invention, or facility of execution, and though he has ſometimes borrowed whole figures from the works of other maſters, and engrafted them in his own, yet he ſo well adapted thoſe of his own invention, to the ſtyle and action of thoſe he borrowed, that the plagiariſm ſeems rather to do him honour, than tend to his diſcredit. He reſided ſome time in Italy, and when he ſhewed his deſigns at Rome, they aſtoniſhed every one who beheld them.

Going one day to viſit Carlo Maratti he found that artiſt at work. Maratti, pleaſed to ſee him, received him very affectionately,

affectionately, and rifing up from his place, offered to put his palette and pencils into the hands of his gueft, but La Fage refufed, declaring that he did not underftand the management of the pencil. 'I am very happy' (replied Maratte) 'to find that is the cafe, for had you known how to paint, as well as you do how to draw, I fhould have been the firft to abandon the art, becaufe you could have filled my place fo much better.' He led a loofe, depraved life, which his repeated debaucheries put an end to, A.D. 1690; he being only at the age of forty-two.

It is here to be obferved that Strutt dates his birth in the year 1648, and the French writers in 1654; now if he was born in 1654, and died in 1690, he could only have been thirty-fix years of age at the time of his death.

La Fage etched a confiderable number of fmall plates from his own compofitions, which are marked with the eafe and energy of a mafter, particularly his fall of the angels, and his Bacchanalian feftivals and proceffions. The following, which are in folio, are among his moft efteemed productions:

A pair "Jupiter and Semele," and "Juno and Eolus," of the frieze form; another pair of "Children Fifhing," and a "Dance by Children;" a large plate of a Bacchanalian fubject, and two large uprights of "The Brazen Serpent," and "The Fall of the Angels."

François Andriot, or Handriot, was born at Paris about 1655. He engraved both in France, and during his refidence in Italy, various fubjects after feveral celebrated painters of thofe countries. His ftyle refembled that of Fr. de Poilly, but his productions were inferior in point of effect to thofe of that celebrated artift. His prints are, however, fought after by fome connoiffeurs, on account of the pictures of the great mafters from which he engraved. His beft works are all in folio, and their fubjects as follow:

"The Virgin fitting, holding on her Knees the Infant Jefus, to whom the little St. John prefents a Rofe," after Raphael, an oval. "The Virgin fuckling the Infant Jefus, attended by an Angel," after Guido, an oval. "A Magdalen," after the fame. "Chrift crowned with Thorns," after Ann. Carracci, without the name of the painter, oval. "Chrift fcoffed at, and crowned with Thorns," after Dominichino, oval. "The Madonna and Child, with St. Michael and St. Marguerite," anonymous. "The good Samaritan," after Pouffin, a large plate. "The Incredulity of St. Thomas," after Le Sueur, a large plate. "Efther before king Ahafuerus," after Sim. Guillebault. "The Wedding at Cana," after the fame. "Pope St. Gregory kneeling before the Altar in a Chapel, and three Ecclefiaftics ftanding on the Clouds." "Jean Everhard, cardinal Niclard," after Jonas de la Bonde, engraven in 1672, and fome of the ftatues publifhed at Rome by Roffi in 1691.

Jean-Baptifte Nollen, or Nolen, was born at Paris in 1655. He was one of the beft pupils of N. de Poilly, and was extremely expert at the mechanical part of his art. After vifiting Rome, he returned and fettled in his own country. He engraved feveral of the large folio prints, entitled "Les Vües, Plans, Coupes, et Elevations du Chateau de Verfailles." "The Miracle of the Loaves and Fifhes," after Raphael, and feveral plates from Carracci, Pouffin, and other mafters.

John Mariette was a native of France, and ftudied painting under his brother-in-law J. B. Corneille, but by the advice of Le Brun quitted that purfuit, and applied himfelf to defigning and engraving. He alfo carried on a confiderable commerce in prints. Some of his compofitions poffefs confiderable merit. The heads of his figures are often well characterized; his drawing, though mannered, is not incorrect. He worked both with the graver and etching needle, and his ftyle of engraving is coarfe and flight. He died at Paris in the year 1742. The principal productions of Mariette are as follow: "Staniflaus-John Jablonowfki," in folio. "St. Peter delivered out of Prifon," after Dominichino, in folio. "Jefus Chrift in the Defart, ferved by Angels," after Le Brun, in folio. "Defcent from the Crofs," after the fame, in folio. "The finding of Mofes," after Pouffin, in folio. "Two Nymphs feated near a Fountain, in which Narciffus is fporting," a beautiful landfcape, in folio. "Jofeph revealing himfelf to his brethren," after M. Corneille, in folio. "The Cure of the Paralytics," after the fame, in folio. "St. Louis receiving the Holy Viaticum," after J. B. Corneille, in folio. "St. Louis received into Heaven," after the fame.

J. P. Mariette, the celebrated connoiffeur, was the fon of John, and etched a few plates after Guerchino, Carracci, and Perin del Vagu. He was born at Paris in 1694, died there in 1774, and the memorable fale of his cabinet took place in the year 1775.

Benoit Thibouft was born at Chartres A.D. 1660, but refided for the greater part of his life at Rome; yet he may be reckoned to have been of the fchool of Mellan. He engraved legendary and fuperftitious fubjects in the ftyle of that artift, though without attaining his excellence, of which the principal are:

A fet of thirty-four plates after F. B. Gaetano, for "Vita beati Turribii, Archiepifcopi Limani in Indiis," publifhed in 4to. at Rome A.D. 1679. "St. Therefa in an Extacy on the Clouds, while an Angel is preparing to pierce her Bofom with a flaming Dart," after Bernini, in folio. "The Statue of St. Bibienc in a Niche," after the fame, in folio. "St. Thomas Aquinas," after Hyacinthe Calandrucci, engraven in 1690, in folio. "St. Rofe kneeling before the Virgin," after Ant. Baldi, in folio. "Martyrdom of St. Peter d'Arbues," after the fame, in folio. "St. Peter of Alcantara in the Clouds, viewing the Crofs," after the fame, in 4to. Portrait of John Baptifte Coccinus, and "The Crucifixion," after Scipio Gaetano, both in folio.

Jean Baptifte Boyer, marquis of Aiguilles, procureur general of the parliament of Aix, in Provence, was born at Aix in 1660, and died in his natal city about the middle of the laft century. Connected by the moft intimate ties of friendfhip with the celebrated Puget, he acquired, in his intercourfe with that fkilful artift, a tafte for the fine arts, and thus became a connoiffeur, defigner, painter, and engraver.

During a journey, which he undertook, to Italy, and after his return to Aix, he formed a collection of paintings, fculptures, drawings and prints, in which he took great delight. He caufed this cabinet to be engraven, and it was publifhed about the commencement of the laft century; but not fatisfied with the firft edition, he brought an artift from Antwerp, Jaques Coelmans, who engraved anew the whole cabinet, which was publifhed in 1744.

Thefe plates having afterwards fallen into the poffeffion of Pierre François Baffan, he fold them as the collection of Crozat.

The firft edition of this collection contains fix fubjects engraved by the marquis himfelf; wherefore he is reckoned among the engravers of the French fchool. The impreffions of thefe plates, of which the fubjects are as follow, are now become very rare, from the plates having been loft or deftroyed.

"The Marriage of St. Catherine," from And. del Sarto. Two figures of Jefus Chrift when young (engraved on the

fame

ſame plate). A pair of landſcapes from Brecourt. "St John," from Manfredi, and a ſmall buſt of a man; the four former of which are engraved in lines, and the two latter in mezzotinto.

In the ſecond edition of his cabinet, are three other engravings by the marquis himſelf, *viz.* "A Magdalen," from J. F. Romanelli; "Portrait of the miſtreſs of Paolo Veroneſe," and "The Adoration of the Magi," from a compoſition of his own. The frontiſpiece of this ſecond edition, engraved by Coelmans, is alſo from a deſign by the marquis.

Antoine Aveline was born at Paris in the year 1662, and died in the ſame city in 1712. He engraved a great number of landſcapes, which are for the moſt part either compoſed, or drawn from nature, by himſelf, and are executed in a neat and agreeable ſtyle. Their ſubjects are principally as follow:

A ſeries of ſix landſcapes, marked Aveline inv. et fec. in 4to. Another ſeries of twelve landſcapes, not numbered, and marked in the ſame manner. Another ſeries of ſixteen views of Verſailles, in folio. Twelve views of chateaus and royal manſions, namely, Trianon, the Menagerie, two views of Clagny, Marly, St. Germain en Laye, Vincennes, St. Cloud, Meuden, Rambouillet, and Chantilli de Chambre, in folio. Twelve views of Paris and ſeveral of its edifices, namely, the city of Paris, the Invalids, two views of the Thuilleries, the Palais Royal, the Luxembourg, the Pont Neuf, Places des Victoires, Hotel de Ville, Notre Dame, the Obſervatory, and the Salpetrières, in folio. Series of twenty views of cities, namely, Lyons, Marſeilles, Havre de Grace, Rouen, Bourdeaux, Breſt, Straſburg, Baſle, London, Amſterdam, Rome, the church of St. Peter, Venice, the place de St. Mark, Turin, Liſbon, Conſtantinople, Jeruſalem, Tripoli, and Tangiers.

Gaſpar Duchange was born at Paris in the year 1662, and died there in 1759. Whether he ſtudied in the ſchool of Audran, or under any maſter, his biographers have not mentioned; but his ſtyle of engraving moſt reſembles that of John Audran, who was his contemporary, though a few years younger than himſelf. He deſervedly obtained the title of engraver to the king, and in the year 1707 was admitted a member of the Royal Academy of Arts. Strutt ſays of him, ſomewhat too coldly, that his ſtyle is neater than that of Audran, and the etching not ſo predominant, but that his drawing is leſs correct and his extremities not marked with ſo maſterly a hand, yet that his prints have much to recommend them to notice; more eſpecially to the notice of ſuch connoiſſeurs as are pleaſed with an agreeable management of the graver. Watelet, with more generous diſcernment, ſays of Duchange, that he was one of thoſe engravers who has beſt ſucceeded in combining mellowneſs with ſtrength in his plates, without imparting coldneſs. It may alſo be ſeen in his works that he repreſented moſt happily the delicate texture of fleſh in his female figures, and that no other of the French artiſts ever excelled him in this reſpect.

It ſeemed as if he had been eſpecially fitted by nature to engrave from the pictures of Correggio; he executed, after this painter, the three celebrated prints of Io, Leda, and Danaë; and, by the ſoftneſs and harmony of his ſtyle, perfectly transfuſed the ſpirit, and imparted to his prints the tone, of this great maſter.

Duchange continued his labours till he reached the advanced age of ninety. He engraved ſome prints of the gallery of the Luxembourg; and in that of the debarkment of the queen at Marſeilles, has ſcarcely been leſs ſucceſsful than in his engravings after Correggio, which is more particularly obſervable in the three ſirens or mermaids who are mooring the galley, and on whom Rubens has laviſhed the graces of his art.

The beſt performances of this artiſt are in folio, and their ſubjects, "Jupiter and Io," after Correggio, drawn at Rome by P. de Pietro, and engraven at Paris by G. Duchange 1705. "Jupiter deſcending in a Golden Shower to Danaë," and "Jupiter in the Form of a Swan careſſing Leda," after the ſame artiſts. The moſt valued impreſſions of theſe beautiful prints are thoſe which were taken before they were retouched by Sornique, who has added draperies to them. "Chriſt in the Sepulchre," after a painting of Paul Veroneſe, in the cabinet of Crozat. This is a bold and vigourous print, much ſuperior to the one formerly engraven by Auguſtino Carracci. "The Birth of Mary de Medicis." "The landing of the Queen at the Port of Marſeilles." "The Citizens of Lyons going to meet the Queen." "The Apotheoſis of Henry IV." all after Rubens. "Solon explaining his Laws to the Athenians," and its companion, "The emperor Trajan adminiſtering Juſtice to his Subjects," both after Noel Coypel. Two ſubjects after the four paintings of Coypel the father, preſerved in the Luxembourg, (Charles Dupuis has engraven the two other ſubjects.) "The Repaſt at the Houſe of Simon the Phariſee," after a painting of Jouvenet in the church of St. Martin in the Fields. "Jeſus expelling the Sellers of Merchandize from the Temple," from a picture of the ſame maſter, preſerved in the ſame church. "The Reſurrection of the Widow's Son," after the ſame, in the church of the Recollets at Verſailles. "Clytie abandoned by Phœbus," after Nic. Bertin, an oval. "Diana diſarming Cupid," after Deſormeaux, engraven in 1718.

The following are all after Antony Coypel: "The Sacrifice of Jephtha. "Tobias recovering his Sight through the Interpoſition of his Son," a capital engraving. "Mary Magdalen." "St. Cecilia," an upright. "The Death of Dido." "Juno borrowing the Ceſtus of Venus." "Venus aſleep." "Diana at the Bath." A ſet of four plates of "The Elements," engraven by Duchange and Des Places. "The Infant Jeſus in the Cradle," after Charles Coypel, engraved by Duchange, at the age of 87.

Duchange has likewiſe engraven ſeveral ſubjects from the paintings of Le Sueur in the hotel du Chatelet.

His beſt portraits are thoſe of Francis Girardon, painted by Rigaud. Charles de la Foſſe, painted by the ſame, and engraved for Duchange's reception into the Royal Academy. Antoine Coypel, ſeated at his eaſel, with his infant ſon Charles by his ſide, painted by himſelf, and engraven by Duchange in 1752.

Antoine Trouvain was born at Montdidier about 1666, and nominated a member of the academy of painting in 1707. He handled the graver with much dexterity, and executed his works in a very neat and agreeable ſtyle. It is not known in what ſchool he ſtudied, though it is probable he received leſſons from Bernard Picart, at leaſt he appears cloſely to have imitated the ſtyle of that artiſt.

He engraved with ſucceſs both portraits and hiſtorical ſubjects, of which the chief are of the folio claſs, and their ſubjects as follow:

"The Salutation of the Virgin," after Carlo Maratti. "Jeſus curing the Blind," after a painting of Ant. Coypel in the Chartreuſe. "The Nuptials of Queen Mary de Medicis with Henry IV." after Rubens. "The Minority of Louis XIII." after the ſame painter, which form part of the collection in the gallery of the Luxembourg. "A drunken Silenus ſurpriſed by two Shepherds," after Ant. Coypel.

Portraits.

Portraits.—The holy Vincent de Paul II. Trouvain, sc. (ſmall folio.) Father de la Chaiſe, confeſſor to Louis XIV. in 8vo. Pierre-Daniel Huet, biſhop of Avranches, after S. de Quoy, in 8vo. Alexis de Buc, prieſt of the congregation of Scribes, after P. Simon, engraven in 1689, in folio. Francis le Bouthillier, biſhop of Troyes, in folio. Claude-Francis Menetrier, of the ſociety of Jeſus, after P. Simon Jean Peſne, painter and engraver, painted by himſelf, engraven by Trouvain 1698. René Antoine Houaſſe, painter and rector of the academy, painted by Tortebat, engraven by Trouvain, for his reception into the academy in 1707, in folio, and Jean Jouvenet, painted by himſelf, engraven by Antoine Trouvain, for his reception into the academy, alſo in folio.

Pierre Drevet the elder was born at Lyons in the year 1664, and died at Paris in 1739. After receiving leſſons in drawing, and probably in engraving alſo, from Germain Audran in his natal city, he went to Paris for improvement, and as Strutt with great probability ſuppoſes, ſtudied for a time under Girard Edelink. He ſoon became a moſt admirable engraver of portraits, to which he chiefly confined his talents, and the encreaſe of his reputation was proportionably rapid. He now contributed to ſpread through Europe the likeneſſes of the royal and noble perſonages of the day; and the fame of Hyacinthe Rigaud the portrait painter, (the anceſtor of the preſent academician of the London Royal Academy,) went hand in hand with his own.

His command of the graver, which is believed to have been the ſole inſtrument of his art, was very great. His engraving is firm though delicate; and his plates highly finiſhed. He drew well, and had the rare art of transfuſing much of the ſtyle and feeling of the painter after whom he was working. In ſhort, the beauty of execution, ſoftneſs, and truth diſplayed in his portraits, have ſtamped on them a value which time ſhall yet be long in effacing.

The only hiſtorical ſubjects from his hand, with which we are acquainted, are "The Entrance of Jeſus Chriſt into Jeruſalem," from a grand compoſition of Ant. Drew, in folio, and "A Crucifixion," with the city of Jeruſalem in the back ground, a large folio, engraved on two plates, and inſcribed P. Drevet exc.

His portraits are numerous, and excepting that of André Felibien, after Le Brun, (which is in 4to.) are of the folio ſize. After N. de Largilliere he has engraven Jean Foreſt. Nicholas Lambert. Maria de Lambeſpine. Helena Lambert, after F. de Troy. Frederic Auguſtus king of Poland, and Nicholas Boileau Deſpreaux, (a ſmall folio.) After de Pelis, and after Vanderwerf, Oliver Cromwell, with attributes. But his principal performances, both in number and merit, are after H. Rigaud, and it is believed that few of theſe are omitted in the following liſt:

Mary de Serre, the mother of Rigaud. Hyacinthe Rigaud himſelf. Nicholas Boileau Deſpreaux. Chriſtina Caroline, margravine of Brandenbourg, &c. Erneſt Auguſtus duke of Brunſwick Lunenbourg, in an allegorical border. Alexander de Bourbon, Comte de Toulouſe, with a glove on the hand; another plate of the ſame ſubject, with the glove removed. Philip V. king of Spain. René-François de Bouveau, archbiſhop of Narbonne. André Hercule, cardinal de Fleury. Maria, ſovereign of Neufchatel, ducheſs of Nemours, engraven in 1707. Louis-Antoine, duke de Noailles. Louis Hector, duke of Villars, the moſt valued impreſſions of which are before the inſcription was altered. Louis, dauphin of France. Francis Louis de Bourbon, prince of Conti, a whole length. Louis XIV. in his roya robes, a whole length figure. Louis XV. ſeated on the throne, clad in his royal robes, companion to the former.

Pierre Devert, the younger, the ſon of the former, was born at Paris in the year 1697, and died in the ſame city in 1739, ſo that Europe loſt both theſe admirable artiſts in the courſe of the ſame year. The ſon had the advantage of the father's inſtruction in that art in which he was deſtined to ſhine ſo conſpicuouſly, and for which he manifeſted an early genius. At the age of thirteen he ſurpriſed the artiſts and amateurs of Paris with an engraving ſo well performed, that probably no man, his father excepted, could have ſurpaſſed it; at the age of nineteen he engraved his folio plate of the Reſurrection, and at the age of twenty-ſix he executed his celebrated whole length portrait of Boſſuet, which has ſince been the admiration of Europe.

Watelet obſerves of the ſenior Drevet, that he might have been regarded as the firſt portrait engraver in the world, in point of delicate and beautiful execution, had he not been exceeded in this reſpect by his ſon; but upon ſuch an occaſion, all idea of rivalry is abſorbed in the reſpect due to the filial and parental feelings. When a father transfers the fruits of his experience, and ſets before his ſon, as rudiments, the final reſults of his own ſtudies, nature ſteps in and identifies their fame.

His whole length portrait of Samuel Bernard is a ſtill more ſurpriſing effort of art; and in both theſe prints the varied expreſſion of the ſurfaces of natural objects;—of fleſh, hair, (particularly the white hair of Boſſuet,) ermine, lawn, lace, mohair, velvet, gold-fringes, carved wood, bronze, marble paper,—each engraven in a peculiar and appropriate manner, may well excite wonder, and moſt the wonder of thoſe moſt intimately converſant with the capabilities of the art. To all this variety of ſubſtances he has imparted the moſt exquiſite finiſh, yet no where is there any affected diſplay of dexterity in the uſe of the graver, as is too frequently obſervable in the works of other engravers, who do not poſſeſs half the powers of Drevet; on the contrary, a violet-like modeſty here adds the charm of innocence to the attractions of beauty.

Drevet did not, however, confine himſelf to portraits, but his abilities were perhaps leſs well adapted to the generaliſed energies of hiſtory, than to the details of portraiture; and it muſt be acknowledged, even of his "Preſentation of Chriſt in the Temple," which is eſteemed his maſterpiece, that its general complexion,—probably from being executed entirely with the graver and dry-needle,—is too metallic.

M. Cochin has obſerved of the engravings of Drevet the younger, "that they are admirable for delicacy and beauty of execution, but much too laboured for the character of hiſtory, which has led perſons of taſte to ſay that his fine engraving is extremely clever, but altogether miſplaced, and tends to impart to his figures the appearance of bronze;" and Huber remarks upon this critique, "that it is applicable only to thoſe prints which he engraved after Ant. Coypel." The truth however lies between theſe critics, who were each ſomewhat biaſſed on the occaſion, by his excluſive preference for a particular mode of art.

The principal hiſtorical works of the junior Drevet are of the folio claſs, and their ſubjects as follow:

"The Adoration of the Shepherds," after Hyacinthe Rigaud. "A Holy Family," which is inſcribed "le parfait modele de toutes les familles Chretiens," after Ant. Dieu. And from the ſame maſter, "John the Baptiſt reproaching

Herod for having efpoufed his Brother's Wife;" and, "The Entrance of Jefus Chrift into Jerufalem."

From the pictures of Ant. Coypel he has engraven, "The Eternal denouncing Adam and Eve after their Tranfgreffion," with a copy of the fame, of fmaller dimenfions, engraven with the utmoft delicacy. "Abraham about to facrifice his Son Ifaac," engraven in 1707. "The Servant of Abraham with Rebecca at the Well." "The Annunciation of the Virgin," with the fame piece under the fame title, of a fmaller fize. "A Chrift on the Crofs." "Jefus Chrift in the Garden of Olives, comforted by Angels," after J. Reftout. "The Prefentation of the infant Jefus in the Temple," after a painting of L. de Boullongne in the choir of Notre Dame, at Paris, a large and capital piece. "The Refurrection of our Lord," after J. André, engraven by P. Drevet at the age of nineteen.

His principal portraits are alfo in folio, and are thofe of Francis de Salignac de la Mothe Fenelon, archbifhop of Cambray, after Jean Vivien. Francis Paul de Neuville de Villeroy, archbifhop of Lyons, after J. Santerre. Claude le Blanc, minifter of war, after Ad. le Prieur. Louis, duke of Orleans, after Ch. Coypel. Adriana le Couvreur, in the part of Cornelia, after the fame, a diftinguifhed piece. Louis XV. in his youth, conducted by Minerva to the temple of Glory, after Ant. Coypel. Dom Arnoul de Loo, fuperior-general of the congregation of St. Maur, after Jouvenet. Nicolas-Pierre Camus de Pontcarré, firft prefident of the parliament of Rouen, after the fame. The Wife of the Pretender, Davids pinx. Romæ. Ifaac-Jacques de Vertamont, bifhop of Conferans, after Fr. de Troy. Robert Cotte, firft intendant of buildings, gardens, arts, and manufactures of the king, &c. painted by Rigaud, and engraven by P. Drevet, jun. for the Academy. René Pucelle, abbé and counfellor of the parliament, after the fame. Guillaume, cardinal Dubois, archbifhop of Cambray, fitting, engraven in 1724. Samuel Bernard, fitting, after the fame. The early impreffions of this plate are known by having been taken before the words "Confeiller d'Etat" were infcribed beneath. Jacques-Benigne Boffuet, bifhop of Meaux, a whole length figure, after the fame, of which we have already fpoken.

Claude Drevet, firft coufin to the preceding, was born at Lyons in 1710, and died at Paris in 1768. Educated by Drevet, he diftinguifhed himfelf by engraving portraits, in which he imitated the ftyle of his coufins with confiderable fuccefs. His principal works are in folio, and are the portraits of Madame le Bret, as Ceres. Henry Ofwald, cardinal d'Auvergne. Charles Gafpar Guillaume de Vintimille, archbifhop of Paris. Philippe Louis, count de Sinzendorf, all after H. Rigaud. Pierre Calvairac, doctor in theology, abbé of Pontignan, is after Adrien le Prieur.

Antoine Rivalz was born at Touloufe in the year 1667, and died in the fame city in 1735. He was the fon of Jean-Pierre Rivalz, who was both architect and painter, and under whom, and the celebrated La Fage, our artift received the elementary part of his education. He afterwards proceeded to Paris, and from thence to Rome, in order to finifh his ftudies.

Rivalz was both painter and engraver, and during his ftay at Rome painted the fall of the rebellious angels, for the prize given by the Academy of Luke, and being declared the fuccefsful candidate, was crowned in the capitol by cardinal Albani, afterward pope Clement XI. He was recalled from Rome by his father, who died a fhort time after his arrival at Touloufe.

He poffeffed confiderable talent at imitating the works of other artifts, and even when he meant to be original, his own refembled either the compofitions of Pouffin or thofe of La Fage.

The following fpirited etchings are by his hand, and from his own compofitions: "Truth driving away the Vices, the Enemies to Art and Science," an allegory to the memory of Pouffin, infcribed to Le Brun. "The Martyrdom of St. Symphorianus," a middling-fized plate, nearly fquare; and four fmall allegorical fubjects, for a treatife on painting which Rivalz publifhed at Touloufe.

Bartholomew Rivalz was the nephew and pupil of Antoine, and etched the following fubjects in fmall folio, chiefly from the compofitions of his uncle:

"The Fall of the rebellious Angels," the painting of which is at Narbonne. "Pætus and Arria;" "Cleopatra;" "Judith and Holofernes;" "Jofeph and the Wife of Potiphar;" "The Death of Mary Magdalen," after Benedetto Lutti, a fmall upright.

Edme Jeaurat was born at Paris about 1672, and died in the fame city in 1738. He was the pupil of B. Picart, and, like his mafter, poffeffed the happy talent of feizing the fpirit of the great painters whofe works he copied. Speaking of this engraver, Dandre Bardon obferves, that he transfufed all the fire of Du Mole into "The Flight into Egypt," which he engraved after this mafter; the picturefque beauties of Paul Veronefe into his "Finding of Mofes;" the fpirit of Vleughel into his print of "Achilles plunged into the Waters of the Styx;" and the graces of Le Clerc into his print of "Achilles recognized by Ulyffes in the Palace of Lycomedes."

Strutt has confounded this artift with Etienne Jeurat, the painter, an error which it is the more neceffary to correct, fince Etienne was a very inferior artift, incorrect in his defign, cold in his execution, and whofe knowledge did not extend beyond the mere mechanifm of his art.

The principal works of Edme Jeaurat are the portraits of Nicolas Vleughel, a Parifian painter, after Ant. Pefne, engraven in 1726. Pierre Pujet, painted by Pujet the fon, both in folio. Eight fables of Fontaine, after Etienne Jeaurat.

After N. Vleughel he engraved "The Meeting of Abigail and David." "The Refurrection of our Saviour," engraven in 1718. "Thetis plunging Achilles into the Waters of the Styx." "Telemachus in the Ifle of Calypfo," engraven in 1724, all of the folio clafs. A fet of three plates of "A Roman Maiden," "A Virgin of Frefcati near Rome," and "A Greek Woman in a Pilgrimage to Rome," engraven in 1734, in quarto. "Jefus Chrift in the Temple difputing among the Doctors," in quarto. "Achilles recognized by Ulyffes in the midft of the Daughters of Lycomedes," after Le Clerc. "Jupiter enamoured of a Nymph," after the fame. "John the Baptift baptizing the Jews in the Waters of Jordan," after Pouffin. "Syrinx, purfued by the God Pan, is received by the River Alpheus," after P. Mignard. "The Body of Jefus on the Knees of the Virgin," after Le Brun. A fet of three fubjects, from Le Brun's defigns for the Gobelin tapeftries, reprefenting "The Reduction of the City of Marfal;" "The Interview in the Ifle of Pheafants;" and "The Ceremony of the Marriage of Louis XIV." But the three following prints in the collection of Crozat are the moft celebrated engravings of Jeaurat, and are all of the folio clafs, namely, "The Interview of Jacob and Rachel," after a painting of P. Fr. Mola. "Repofe during the Flight into Egypt," after the fame. "The finding of Mofes," after Paul Veronefe.

Claude Gillot was born at Langres in 1673, and died at Paris in 1722. His father, who was a painter, communicated to young Claude all the knowledge of which he was maſter, and afterwards ſent him to Paris to proſecute his ſtudies in the ſchool of Jean Baptiſte Corneille.

Fauns, ſatyrs, and other comic and ſatirical ſubjects were the favourites of his pencil. On account, however, of ſome productions which he executed, of a more ſerious character, he was admitted into the Academy of Painting in 1715.

Gillot had the honour of giving leſſons to the celebrated Watteau; but they ſeparated after a ſhort time, as is ſaid, from the envy felt by the maſter at the ſuperior talents of his pupil. As Watteau roſe to eminence, Gillot gradually relinquiſhed painting, and dedicated his time to engraving. His pictures are now forgotten, but his drawings and etchings are ſtill ſought after by the curious.

The principal works of Claude Gillot are in ſmall folio, and their ſubjects as follow: "The Feſtival of Diana interrupted by Satyrs," Cl. Gillot fecit. "Feaſt of Bacchus celebrated by Satyrs and Bacchantes," id. fec. "Feſtival of Pan celebrated by Sylvans and Nymphs," id. fec. "Feſtival of the God Faunus," id. fc. Theſe four are all of the ſame ſize, and form a ſet: the plates for the fables of La Motte Houdart are alſo by Gillot.

Nicholas Henry Tardieu was born at Paris A.D. 1674, and died in the ſame city in 1749. He ſtudied under Le Pautre and Jean Audran, was admitted a member of the French academy in the year 1720, and in the courſe of a long profeſſional career produced many excellent engravings, and educated many able pupils, among whom were Cars, B. Baron, Le Bas, and Tardieu the ſon.

Tardieu was a good draftſman, and brought his plates very forward in the etching, finiſhing them afterwards with the graver in a manner that ſhews the ſoundneſs of his taſte; few before him had mingled, with ſo much addreſs, free hatchings with regular courſes of lines. There is much depth of tone in his prints, and in general a vigorous and tolerably well harmonized chiaro-ſcuro. He was engaged in the execution of ſome of the moſt celebrated works of his time, ſuch as the collections of Crozat and of Verſailles, and the pictures of Le Brun.

Of his numerous hiſtorical engravings, which are in general of the folio dimenſions, the following will be found the moſt remarkable:

A pair of grand friezes, the one repreſenting the family of Coriolanus kneeling before him; the other, the taking of Carthage by Scipio, after Julio Romano. Another pair of large friezes, after the ſame maſter, one repreſenting the continence of Scipio; the other Scipio rewarding his ſoldiers. "Jupiter enamoured of Alcmena," after the ſame painter. "The Annunciation," after Carlo Maratti. "A Holy Family," in which the Virgin is ſeen ſeated, holding the infant Jeſus, to whom angels preſent fruits and flowers, after André Luigi d'Aſſiſe. "Adam and Eve after the Fall," from a painting of Dominichino, in the poſſeſſion of the duke of Devonſhire; one of the moſt beautiful prints of Tardieu, and engraven with much more preciſion than the ſame ſubject by Baudet. "The Scourging of Chriſt," after Le Brun, in folio. "Chriſt on the Croſs, at the Foot of which are ſeen Mary Magdalen, St. John, and the Virgin," after the ſame. "The Body of Chriſt," a compoſition containing three figures, after the ſame. "Holland," painted alſo by le Brun in the war ſaloon at Verſailles. "Wiſdom, Secrecy, Valour, and Prudence," the four chief qualities of a perfect miniſter, after Le Sueur, a rare print. "Jeſus ſpeaking to the Samaritan Woman," after Nic. Bertin. "Jeſus appearing to Mary Magdalen as a Gardener," or the "Noli me tangere," after the ſame. "The Martyrdom of St. Peter," after Seb. Bourdon. "A Crucifixion," after Joſeph Parrocel. "St. Charles Boromeus," after P. Dulin. "The Salutation of the Virgin," after a painting in the dome of the Aſſumption, by Ant. Coypel.

From the ſame maſter Tardieu has engraven "Vulcan ſhewing Venus the Arms prepared for Æneas." "Venus in the Aſſembly of the Gods, ſoliciting Jupiter in favour of Æneas." "Juno ſoliciting Æolus to raiſe a Tempeſt againſt the Fleet of Æneas;" which three prints make part of a ſeries engraven after the paintings of the hiſtory of Æneas in the Palais Royal. "Apollo and Daphne." A pair of capital engravings of "The Conteſt between Agamemnon and Achilles;" and "The Parting of Hector and Andromache," and another pair from the ſtory of Cupid and Pſyche.

From the pictures of Watteau he has engraven "The embarraſſing Propoſal;" "Paſtoral Pleaſure;" "The Elyſian Fields;" "The grand Embarkation for Cythera;" and from the pictures of Rubens, twelve plates of the Hiſtory of Conſtantine the Great.

Elizabeth-Claire Tournay, wife of N. H. Tardieu, alſo diſtinguiſhed herſelf by engraving the following ſubjects:

"The Concert," after J. F. de Troy. "The Muſtard Merchant," after Ch. Hutin. A pair of "The Charitable Lady," and the "Catechiſing Prieſt," after P. Dumeſnil, the ſon. "An Old Coquette," after the ſame, and "Tranquil Sleep," after Et. Jeaurat, all in folio.

Jaques-Nicholas Tardieu, the ſon, was born at Paris in 1718, and was alive in 1789. Being educated by his father, he aſſiſted in the execution of ſeveral large works. In general young Tardieu employed the graver much more than the point. Hence his prints are more ſolid than thoſe of his father, but leſs rich in thoſe rougher energies which charm the eye of the connoiſſeur. He was a member of the Royal Academy, and occaſionally occupied himſelf both with engraving portraits and hiſtorical ſubjects.

His wife, Louiſa du Vivier, who was the daughter of the celebrated medaller of that name, and is well known for ſeveral reſpectable engravings.

The following is a liſt of a few of the beſt works of J. N. Tardieu:

"Jeſus Chriſt appearing to the Virgin," after Guido. "A Magdalen in the Deſart," after Paul Pagani. "Our Saviour curing the Paralytic," after Reſtout. "Diana and Acteon," after Fr. Boucher. "Monument to the Memory of Andeſley Schovel," after the ſame. "The Flemiſh Breakfaſt," and "The Alchemiſt," two companion prints, after D. Teniers. "The Miſeries of War," after the ſame. Two landſcapes, entitled "The Sweeper," and "The Fruits of Autumn," after Cochin the ſon, all of the folio claſs.

He has likewiſe engraven, conjointly with his father, ſeveral frontiſpieces and vignettes after Cochin, as well as ſeveral ſubjects for the collection of the gallery of Verſailles, from the drawings of Maſſe, after Le Brun.

His beſt portraits are in folio, and are thoſe of Robert Le Lorrain, ſculptor in ordinary to the king, painted by Nonotte, and engraven by Jac. Nic. Tardieu, for his reception in the academy in 1749. Bon de Boullongne, painter in ordinary to the king, painted by Gilles Allou, engraven by the ſame Tardieu, for his reception at the academy in 1749. A whole length figure of Louis XV., after Vanloo. The queen of Louis XV., after Nattier. Maria Henrietta of France, after the ſame. Dimetri, prince Gallitzin, ambaſſador extraordinary from the court of Ruſſia to that of Vienna, after Drouais the ſon. The archbiſhop of Bourdeaux, after Reſtout.

Pierre-

Pierre-François Tardieu, coufin-german of the former, was born at Paris about 1720. He was taught the art of engraving in the houfe of Tardieu, whofe manner he clofely copied. The moft confiderable works of this artift are the following:

"The Judgment of Paris," after Rubens, in folio. "Perfeus and Andromeda," after the fame, in folio. Different pieces of architecture, after Panini. Several plates for the large edition of Fontaine's Fables, after Oudry. Several plates of animals for Buffon's Natural Hiftory.

Marie-Anne Rouffelet, the wife of P. F. Tardieu, alfo engraved feveral fubjects, and among others, "St. John in the Defart," after Claude Vanloo, in folio; and fome of the plates for Buffon's Natural Hiftory.

Claude Duflos was born at Paris A. D. 1678, and died in the fame city in 1747. Under what mafter he ftudied has not been mentioned: his ftyle appears to be formed from ftudying the beft works of Edelink and De Poilly, and though he occafionally called in the aid of etching and the dry point, he worked chiefly with the graver, handling that inftrument with great dexterity, yet with a dexterity perfectly fubfervient to his knowledge of drawing, in which he was no mean proficient. His engravings are finifhed with confiderable care and neatnefs, but in their general complexion are fomewhat cold and metallic when compared with thofe of Audran and Duchange.

From the numerous catalogue of his hiftorical works we felect the following, which are all of the folio dimenfions:

"The Victory of St. Michael over the Devil," an upright, engraved for the Crozat collection; and "The entombing of Chrift," both after Raphael. The fame fubject. "The entombing of Chrift," after Pietro Perugino, for the Crozat collection. "Jefus Chrift with his Difciples at Emmaus," after Titian, from the fame picture, which was engraven by Maffon. The fame fubject, after Paul Veronefe. "A Concert of Mufic," after Dominichino, and "A Buft of the Virgin," after Guido.

From the pictures of Albano he has engraven "The Annunciation." "Jefus Chrift as a Gardener, appearing to Mary Magdalen," or the "Noli me Tangere." "St. Cecilia," and "Love defpifing Riches." "The Prefentation of our Saviour in the Temple," after a painting of Le Sueur, in the grand feminary of St. Sulpice. "The Defcent from the Crofs," after a painting by the fame artift, in the church of St. Gervais, an oval. "The Woman taken in Adultery," after Nic. Colombel. "The Repaft at the Houfe of the Pharifee," after the fame. A companion to the former is engraven by M. Doffien. "Monk Zozimus adminiftering the Holy Sacrament to St. Mary the Egyptian," after Lubin Baugin.

The following eight are from the pictures of Le Brun; "The Maffacre of the Innocents." "Jefus Chrift on the Mount of Olives." A large crucifix, with the infcription "Helas! eft ce amour," &c. "A Crucifix with Angels," copied from the beautiful print of Edelink. "The Body of Chrift at the Foot of the Crofs, with the Three Maries and St. John." "Defcent of the Holy Spirit on the Apoftles." "The Affumption of the Virgin." "The repentant Magdalen," (with four French verfes).

The following fix are from Ant. Coypel, *viz.* "The Annunciation." "Mary Magdalen at the Foot of the Crofs." "The Triumph of Galatea." "Love ftung by a Bee," an oval, with "Zephyrus and Flora," for a companion print, and "the Marriage of Bacchus and Ariadne." A pair of upright plates of "The Triumph of Amphitrite," and "The Triumph of Bacchus," after Charles Natoire, clofes our lift of the hiftorical works of Claude Duflos.

His beft portraits are thofe of Jean François Paul de Gondy, cardinal de Retz, in 4to.; and in folio, Nicolas Lyon, procureur to the king, after L. Herluyfon. Denis François Bouthillier de Chavigny, bifhop of Troyes, after H. Rigaud. Jean Jacques Gaudart, counfellor to the king, after De Largilliere. Phillippe, duke of Orleans, after R. Tourniere, and Marc Renée de Voyer, after H. Rigaud.

François Chereau was born at Blois in the year 1680, and died at Paris in 1729. He vifited Paris when very young, and ftudied in the fchool of the Audrans; though his ftyle of engraving rather refembles that of the Drevets.

Chereau is diftinguifhed by the correctnefs of his outline, and the beauty of his execution. He appears to have worked entirely with the graver, which he handled with great care and ability, but which, when not mingled with the more picturefque refults of etching, is apt to produce a cold and laboured appearance, fuch as is but too evident in the otherwife meritorious engravings of this artift. He has alfo impaired the brilliancy of his chiaro-fcuro, by working his lights to too low a tone. The following, which are of the folio fize, will probably be found among the beft of his hiftorical works:

"St. John in the Defart," after Raphael, a fmall upright, engraved for the Crozat collection. "The Crucifixion," (a large upright) from Guido. "St. Catherine of Sienna," after Frere Jean André. "St. Celicia chanting the Praifes of the Almighty," after P. Mignard. "St. Therefa in Contemplation," and "St. Ignatius," founder of the fociety of Jefuits.

The following five portraits are infcribed with his own name, as the painter or defigner, as well as the engraver. Raoux, bifhop of Montpellier, in folio. Charles Hyacinthe Dangot du Bouillon, procureur general, in folio, an oval. Jacques Saurin, a celebrated preacher of the reformed religion, in 4to. and alfo an oval. Pierre Bayle, the celebrated critic, in 4to. Chriftine Renate Zorn, engraven in 1716, in 4to.

After other mafters, he has engraven, of the folio fize, Louis de Boullongne, painted by himfelf, engraven by Fr. Chereau for his reception into the academy in 1718. Nicolas de Largilliere, painted by himfelf. Charles Nicolas Taffourreau de Fontaine, bifhop of Embrun, painted by Rigaud the younger. The fix following are after the pictures of the elder Rigaud. Jean Baptifte Louis Picon, counfellor to the king. Nicolas de Launay, director of the mint. Claude Bernard Rouffeau, counfellor to the king. Conrad Detlew de Dehn, minifter to the duke of Brunfwick Lunenbourg. Andre-Hercule, cardinal de Fleury, prime minifter. Melchior, cardinal de Polignac; in folio, a capital portrait. Louis Pecour, ballet mafter, painted by Rob. Tournieres, another capital portrait. Elizabeth Sophia Cheron, wife of Jacques le Haye, painted by herfelf. Eufebe Renaudot, an abbé, and diftinguifhed fcholar of the laft century, after Ranc; and Louifa Maria, princefs of Great Britain, after A. S. Belle, an oval.

Jacques Chereau (called the younger) was born at Blois in the year 1694, and died at Paris in 1759. He became the pupil of his elder brother François, but poffeffing no original powers, he could only imitate, which however he did with fome fuccefs. Invited hither by Du Bofc, he vifited England, but found, or fancied, that his talents were undervalued, and returned to Paris.

He appears, however, not to have been more fuccefsful as an artift in his native country, for we find that he foon afterward

afterward relinquifhed engraving altogether, and confined his attention to the traffic of a print-fhop, which had devolved to him by the death of his brother.

We begin our account of the hiftorical prints of Jacques with thofe which he engraved after the pictures of Raphael.

" St. John in the Defart, difplaying a Burning Crofs." " The Virgin feated in a Landfcape, holding the infant Jefus, and the little St. John kneeling by her Side," for the Crozat collection. This piece, which is known under the name of " La Belle Jardiniere," was likewife engraven by Rouffelet. " The Transfiguration," a large upright, arched at the top. " A Holy Family," in which the Virgin is feen with the infant Jefus on her knees, who is regarding St. Jofeph. Thefe, as well as the remainder of his hiftorical works, are all of folio dimenfions. " David bearing the Head and Sword of Goliah," after a painting of Dom Feti. " David, from the Top of his Houfe, viewing Bathfheba," after Raoux. " Jefus wafhing the Feet of his Apoftles," after Nicolas Bertin. " Iphigenia in Tauride," with the infcription, " Quantum religio potuit, &c." after the fame. " Vertumnus and Pomona," after François Marot. " St. Anne," after M. Corneille. " The Defcent from the Crofs," after Charpentier. " Defign for a Sarcophagus," after N. N. Coypel. " A Young Female careffing a Dove," after Carlo Vanloo.

The following are the only portraits infcribed with the name of J. Chereau as the painter or draftsman. Phillip of Orleans, regent of France, in 8vo. Profile of George I. king of England, engraven at London, in 4to, rare. Jean Marie Viccnti, chancellor of Venice, in 4to., round. Michael de Montagne, engraven in 1715, in 4to. oval. Jacques Augufte de Thou, in 4to., oval. Jean Baptifte Jofeph Languet d'Orgy, curé of St. Sulpice.

Portraits after different painters. Jean Soanen, bifhop of Senez, after Raoux, in folio. Charles Joachim Colbert, bifhop of Montpellier, after the fame in folio; and Jane of Arragon, queen of Sicily, after Raphael in folio.

Louis des Plaus was born at Paris A. D. 1682, and died in the fame city in the year 1739 or 1740. He fuccefsfully mingled etching with the work of the graver, and the merit of his beft works is fo confiderable, that Watelet fcarcely allows him to be inferior to Audran; he was engaged, with the moft eminent artifts of his time, in engraving for the Crozat collection. His moft efteemed prints are in folio, and their fubjects as follow: " Danaë receiving the Golden Shower," after Titian. A pair of uprights, after Paul Veronefe, entitled " Wifdom the Companion of Hercules," and " Paul Veronefe between Vice and Virtue." From the fame painter, he has alfo engraven " Happy Love," and a fquare plate, entitled " Refpect." " The wafhing of Feet," after a painting of Mutien in the metropolitan church of Rheims, a grand compofition. " St. Claire borne on Clouds and furrounded by Angels, with the Dragon overthrown at her Feet," from a painting of J. B. Gauli, ftyled the Bachiehe. " The Adoration of the Kings," in which is feen on the one fide St. Longin in his armour, and on the other St. John the evangelift with the chalice, after Jul. Romano. " The Triumph of Titus and Vefpafian," after the fame, a fuperb print. " Calvary, or Chrift between the Thieves," after Caracci, an upright for the Crozat collection. " The Martyrdom of St. Peter," after Calabrefe. " The Purification of the Virgin," after Tintoret. " Diana and Acteon," after Carlo Maratti. " The Rape of Helen," after Guido. " The Birth of Adonis," after Carlo Cignani. " Roman Charity." " Hercules combating the Centaurs." " The Sacrifice of Abraham." " The gathering of Manna," its companion. " The Sacrifice of the Prophet Elias;" and " The Splendour of the neighbouring Powers of France," are all after Ch. le Brun. Among his very beft engravings may be reckoned the following, after Jouvenet. " Jefus healing the Sick," a very large plate. " Elevation of the Crofs," and " The Defcent from the Crofs," a pair of large uprights. " St. Bruno at Prayer." " Aftyanax torn from the Arms of Andromache." " Venus caufing Arms to be forged for Æneas."

After the pictures of Ant. Coypel, Des Places has engraven, " Triumph of Venus on the Waters." " Love difarmed by a fair Nymph," an oval. " Love fheltered in the Houfe of Anacreon." " Minerva drawing Truth from a Well, and expelling Error and Ignorance," engraven in 1716. " Alcides reftoring Alceftes to king Admetus." " Æneas faving his Family from the Conflagration of Troy." " Funeral Pomp of Prince Pallas," and " Jupiter tonans." The three latter connect with the feries painted from the hiftory of Æneas, in the Palais Royal, and publifhed in twelve large plates, engraven by the moft celebrated engravers of the time.

From the pictures of Ch. Coypel, fon of Antoine, we find a pair entitled " Sweet and pleafing Education," and " Dry and repulfive Education," and " The Matron of Ephefus." And from thofe of Louis de Boulogne " Fire" and " Water," two prints of the fet of four elements, of which Charles Dupuis engraved " Earth" and " Air;" and " The Annunciation of the Virgin," after a painting in the chapel of Verfailles. " The Servant of Abraham delivering to Rebecca the Prefents fent by his Mafter," after A. Guy Halle. " Diana and Endymion," after Nic. Fouché. " A young Girl, with a Bird," after Deformeaux; and " A young Girl playing on a Lute," with the title " Amufement efpagnol," after Gil. Allou, are in 4to. " Abraham receiving Hagar," after Carlo Vanloo, " Venus bringing the Dictamnum to cure the Wound of Æneas," after J. B. Nattier. " Leda careffed by Jupiter in the Form of a Swan," after P. Jac. Cazes. " Repofe of Galatea," after the fame. Of a fet of four prints, called " The Surprifes of Love," after the fame painter, Des Places engraved two, namely " Achilles and Deidamia," and " Hercules and Omphale." The four feafons, after the fame, are engraven by him in conjunction with Beauvais. Two fubjects after Watteau, " Painting," and " Sculpture." " Rural Repaft." " The hunting of Lions and Tigers," after Ch. Parocel. " Orpheus obtaining from Pluto the Return of Eurydice," after Rubens.

The beft portraits of our artift are thofe of Everard Titon du Tillet, inventor of the French Parnaffus, after N. de Largilliere. Marie Anne Duclos, a celebrated tragic actrefs, in the character of Ariadne, after the fame. Charles François Silveftre, youngeft fon of Ifrael, after I. Herault; and Pope Pius V. obtaining from heaven the victory of Lepanto, after Fre Jean André, engraven in 1714: and the three following are engraved from fculpture, namely, " Antique Statue of Hercules killing the Hydra." " Marcus Curtius leaping into the Flaming Gulph," from the equeftrian ftatue by Bernini, in the gardens of Verfailles; and a ftatue of " Leda," after Corneille van Cleve.

Charles Dupuis was born at Paris in 1685, and died in the fame city in 1742. He was the pupil of Gafpar Duchange, and afterwards became his fon-in-law. He vifited England, but the climate not agreeing with his health, he returned to his native country, and was afterwards admitted a member of the Royal Academy.

In

In moſt of his prints, he employed the aid of aquafortis; he drew with conſiderable ability, and his works in general indicate, that he poſſeſſed a profound knowledge of his art. He engraved with equal ſucceſs portraits and hiſtory. The following are among the moſt eſteemed of his engravings, and are all of the folio claſs.

"St. John preaching in the Deſart," after Carlo Maratti, engraved for the Crozat cabinet. "Ptolemy Philadelphus granting Liberty to the Jews," after Ant. Coypel. "Alexander Severus cauſing Corn to be diſtributed to the Romans," after the ſame, both uprights. The four other ſubjects, which, with the two preceding form a ſet, were engraven by Duchange. Two prints, repreſenting "Air," and "Earth," after L. de Boullogne, in folio. The two others, "Fire," and "Water," (which complete the ſet of four elements) were engraven by Deſplaces. "Cupid triumphing over Pan," after Ant. Coypel. "Diana repoſing, ſurrounded by her Nymphs;" and "Rinaldo and Armida," after the ſame. "The Paſſage of the Rhine," after Le Brun. "The Marriage of Joſeph and Mary," after Carlo Vanloo. "King Charles I. repreſented in Priſon," after Raoux.

Charles Dupuis alſo engraved, after the paintings of Euſtache Le Sueur, in the hotel du Chatelet, from drawings by B. Picart, conjointly with Duchange, Duflos, Deſplaces, and Beauvais, "The Occupations of the preſent Age," after Ant. Watteau. "The Leſſon of Love," after the ſame, and "The philoſophic Huſband," Act V. ſcene laſt, after Nic. Lancret.

His moſt eſteemed portraits are thoſe of Jean Pittard, ſurgeon to king St. Louis. Ch. Dupuis del. et ſc. in 8vo. Henri de Lorraine, duke of Guiſe, termed the Gaſh, after Dumouſtier. Jerome Bignon, librarian to the king, after Coyzevox. Louis Marchand, organiſt to the king, after Robert, all in 8vo. but the following are of the folio ſize; Nicholas Couſtou, ſculptor to the king, painted by Le Gros, and engraven by Dupuis for his reception into the academy in 1730. Nicolas de Largilliere, painter to the king, painted by Gueulain, and engraven by Dupuis for his reception into the academy in 1730. Louis XV. ſitting, after Ranc, and Madame Bouché of Paris, in the coſtume of a veſtal, after Raoux.

Nicolas Gabriel Dupuis, the brother of Charles, was born at Paris about the year 1696, and died in the ſame city in 1770. He was at firſt a dyer, and was a long time occupied in engraving ornamental plates for printing linen. He was ſo extremely modeſt, that he never even dreamt of becoming a member of the academy; but having taken leſſons in engraving from Duchange, and executed ſome plates for the gallery of Verſailles, after Le Brun, from deſigns by Maſſe, he at length became better known, and his own merit, ſeconded by the intereſt of Le Brun, introduced him to the Royal Academy of France.

His merits were lettle inferior to thoſe of his elder brother; and his ſtyle, in the earlier part of his career, was the ſame; but diſcovering that the ſteams of aquafortis impaired his health, he ever after worked with the graver alone, handling that inſtrument with much freedom and facility.

Like his brother, he engraved both portraits and hiſtorical ſubjects; of which the following are the moſt celebrated:

"The Guardian Angel," after Dom Feti. "Amuſement of paſtoral Life," after Georgione, for the Crozat collection. "The Adoration of the Kings," after Paul Veroneſe, alſo for the Crozat collection. "The Death of Lucretia," after Guido. "St. Sebaſtian," after L. Carracci, engraven in 1770. "The Virgin and the infant Jeſus," after Annibal Caracci. "Æneas reſcuing his Father Anchiſes from the burning of Troy," after Carlo Vanloo. "St. Nicolas, (the patron of mariners,) and St. Francis at Prayer," after Pierre. "A ſleeping Nymph diſcovered by the Fauns," after L. Cheron. All theſe ſubjects are in folio.

Portraits.—Gaſpar Duchange, engraver to the king, painted by Vanloo the ſon, in 4to. Girard Audran, engraver to the king, from a model by Coyzevox. Charles Francis Paul le Normand de Tournehem, director general of the arts, painted by L. Toque, engraven by Dupuis for his reception into the academy in 1754. in folio. Phillip Wouvermans, a Dutch painter, after C. de Viſſcher in folio. Pedeſtrian ſtatue of Louis XV. erected in the city of Rennes, executed by Le Moine, in folio. Equeſtrian ſtatue of Louis XV. erected in the city of Bourdeaux, executed by the ſame, in folio.

Jean Du Vivier, or De Vivier, an engraver chiefly of dies for coins and medals, was born at Liege in 1687, and died at Paris in 1761. He came to Paris, and was admitted a member of the Royal Academy in 1718. He alſo received a penſion from Louis XV. and apartments in the gallery of the Louvre. Among all the artiſts of his time, Vivier ſeized the moſt ſtriking reſemblance of that prince. The moſt remarkable of the great number of medallions engraved by this artiſt are thoſe of the coronation of Louis XV., the equeſtrian ſtatue of this Prince, erected in the Place de Bourdeaux, the buſts of the king at different ages, and that of Peter the Great.

Delicacy and ſpirit characterized all the productions of Vivier; gentleneſs and modeſty were the prominent features of his moral character. He engraved with the ſame ſpirit on copper. His prints are all either inſcribed, Giovan, or G. de Vivier fecit.

The following, among other productions of this artiſt, are very much valued by connoiſſeurs:

The portraits of Bartholet Flamaël, a painter of Liege; and Pierre de Gouges, advocate of the parliament, after R. Tourniere, both in folio. "A Flemiſh Cook drawing a Fowl, and a Woman bringing her ſome Drink," inſcribed Ant. Van Heuvel pinx. G. de Vivier fec. aq. fort. 4to. "The entombing of Chriſt;" in the middle is an angel ready to cover the body with linen, on the right Joſeph of Arimathea holding a torch; inſcribed Anton. Van Heuvel inv. G. de Vivier fecit, in folio. "The Temptation of St. Anthony." In this print the venerable ſaint is ſeen kneeling before his praying deſk, rejecting the ſolicitations of a maquerelle with the wings of a bat, who is pointing to a courteſan richly attired. This is a very rare and curious work.

Nicolas Dauphin de Beauvais was born at Paris in 1687, and died in the ſame city in 1763.

Beauvais was the pupil of Jean Audran, and the ſon-in-law of Gaſpar Duchange.

From the circumſtance of his having engraved one of the ſeries of pictures which ſir James Thornhill painted for the cathedral church of St. Paul, the French writers on art have conjectured that he muſt have reſided for a time in London; but as no man may engrave plates within an Engliſh cathedral, a reduced copy was probably made from the original picture, and this might have been tranſmitted to Paris, with nearly the ſame eaſe, as to an artiſt's chambers in London.

The ſtyle of Beauvais varied at different periods of his life, and in his beſt works bears conſiderable reſemblance to that

that of Edelink. Huber says that he possessed greater talents than he enjoyed reputation.

The works of this artist which are best known, are the following: The Virgin and the infant Jesus on a Pedestal, beneath which are several Saints, after a celebrated painting by Corregio in the Dresden gallery, known under the name of "St. George," a large upright. "The penitent St. Jerome," after Vandyke, the original of which is also in the Dresden gallery. "The penitent Magdalen in the Desart;" after B. Luti, for the Crozat collection. "The Triumph of Bacchus and Ariadne," after Poussin. "Cupid stealing Thunder from Jupiter," after le Sueur, a circle. "The burning and Metamorphosis of the Vessels of Æneas," and "The Death of Pallas," both after Coypel. "The Resurrection of Christ," after P. Jac. Cazes. A set of, "The four Seasons," after the same painter, engraven by Beauvais and Desplaces. "The Pentecost, or Descent of the Holy Spirit," after Frere Jean André. "Elymas the Sorcerer struck blind," after sir James Thornhill. "And a Monument in honour of William Earl Cowper," all of the folio class.

Charles Nicholas Beauvais, the son, was born at Paris in the year 1730, and generally engraved in concert with his father. The only engravings which are known to have been executed by him alone, are the portrait of Juste Aurele Meissonnier, (an architect,) from a drawing by himself, and a print after F. Boucher, entitled "Sleep interrupted."

For the family of Le Sueur, who were celebrated engravers on wood, and lived, some of them, about this time, see Wood *Engraving*.

Frederic Hortemels was born at Paris some time about the year 1688. He always resided in his native city, and appears to have studied in the school of Audran. Some few of his engravings have very little etching in them, but in his best prints he has more equally united the use of the point with that of the graver. They resemble, in style, the engravings of Benoit Audran, but are somewhat more mellow, and many of them possess considerable merit: he has however been censured by some critics for the too abundant introduction of coarse dots in his flesh.

Of his plates, which were principally executed for the Crozat collection, the following will probably be found most deserving the attention of the collector:

The portrait of Philip of Orleans, after J. B. Santerre. "Christ bearing his Cross," after Georgione, and "The Adoration of the Kings," after P. Veronese, both engraved for the Crozat collection. "The Marriage of St. Catherine," after the same painter. "The Birth of St. John the Baptist," after Tintoret. "Christ and the Woman of Samaria," after B. Garofalo, engraved for the Crozat collection. "Cain contemplating his murdered Brother," after Andrea Sacchi, engraved for the same collection; and "The Pentecost, or Holy Ghost descending on the Apostles," after Gaudentio Ferrari, all of the folio class, but not very large.

Maria Madeleine Hortemels was born at Paris in the year 1690 or thereabout; according to Watelet she was the daughter of Frederic Hortemels; but if the French writers have given in truly the dates of their respective births, this is impossible. It is more likely that Basan is in the right when he calls her the cousin of Frederic; she became the wife of Charles Nicholas Cochin the elder, and author of the following engravings, which are chiefly etchings performed with freedom and spirit, and finished with the graver.

"Mercury announcing Peace to the Muses," engraved (in a circle) from M. Corneille's cieling of the queen's saloon at Versailles: "Penelope surrounded by her female attendants," and "Aspasia disputing among the Grecian Philosophers," are also after Michael Corneille.

After N. Bertin she has engraven "St. Philip baptizing the Eunuch of Queen Candace;" and "Iphigenia," with the inscription "Quantum religio potuit." "The Triumph of Flora" is after Poussin; and "Franche-Comté," conquered the second time, after Le Brun. "Don Quixotte with a Beard," designed by Cochin junior, and engraven by his mother. "The charming Catin," after the same, engraven by the same. "The Singer of Canticles," after the same, engraven by the same. The above are all of the folio class. "The grand Lama and the king of Tangut," for a collection of voyages, by the same artists, in 4to. and the following folio portraits after Hyacinthe Rigaud, namely, Henry de Thiard de Bissy, cardinal bishop of Meaux, and Gaston de Rohan de Soubise, cardinal bishop of Strasbourg.

Charles Nicholas Cochin, the father, was born at Paris in the year 1688, and died in the same city in 1754. He was not the first of this name known as an engraver, being descended from Nicholas Cochin of Troyes, who flourished about the middle of the seventeenth century.

The subject of our present notice cultivated painting till he attained the age of twenty-two years, and afterward devoted himself chiefly to engraving. He was an excellent designer, and engraved with much taste and spirit, especially when the figures were of the middle size. He was not equally successful in those of larger dimensions, not being able, or not willing, to invigorate accordingly his style of execution. In his smaller works, his shadows are hatched with a loose and free hand, and his forms drawn with much of artist-like feeling. Cochin published a great number of prints, of which we shall only mention the most celebrated.

The two portraits which he engraved for his reception into the Royal Academy in 1731, are those of Jacques Sarazin the elder, sculptor in ordinary to the king, and Eustache le Sueur, painter in ordinary to the king, both in folio. "Alexander and Roxana," after Raphael, in folio. The same subject of the same size, but differently treated, the figures being without drapery; both of these engravings are in the Crozat collection. "Hercule Gaulois, or Eloquence," and "Calumny painted by Apelles," after drawings by Raphael. It would appear that this pair of engravings on copper were combined with wood-engravings by Nicholas le Sueur, and printed in chiaro-scuro. "The Inflexibility of St. Basil before Motest, Prefect of the East," after Fr. le Moine. "Jacob discovering himself to Rachael on his Arrival in Mesopotamia," after the same. "Jacob before Laban excusing himself for his Artifice," after J. Restout; a companion print to the preceding. "The Destruction of Armida's Palace," after the same. "Jacob pursued by Laban," after N. Bertin. "The Servant of Abraham accosting Rebecca," after the same. "The Trinity," and "The Assumption," from two paintings by Noel Coypel. "The History of St. Augustin," engraven in seven plates, after L. Boullongne. The above are all of the folio class, but generally small. The four following are in 4to. "Reception of a Bishop under a Tent," after the same. Frontispiece for the order of St. Michael, after the same. "The Lame cured," after P. Jac. Cazes. A series of fifty-two subjects of the history of Languedoc, after the same. "The Generosity of Harmonia, Daughter of Gelon, King of Syracuse," with an historical explanation, after J. B. M. Pierre. "A Conversation Piece in a Garden," after the same painter, in small folio. The following are all after Watteau, and in folio. Two plates of "Italian Comedians

on the Stage." Another pair of "Love in the French Theatre," and "Love in the Italian Theatre." "The flying Camp," and "Return from the Campaign." "A Detachment of Soldiers making a Halt." "The Grove of Bacchus," and "The Village Bride," a capital piece both of the painter and engraver.

Charles Nicholas Cochin, the fon, was born at Paris in 1715, and died in the fame city in 1788. This celebrated artift inherited from nature the moft happy difpofitions and talents for the arts of defign, and feveral circumftances concurred to haften the developement of his faculties. He was the fon of Charles Nicholas Cochin and of Marie Madeleine Hortemels, and received from them inftructions in art, along with the other branches of his education, which was conducted under the paternal roof. He gave many proofs at a very early age of the rapidity of his progrefs in arts and letters. In 1740 he vifited Italy in company with the marquis of Marigny, and in 1758 publifhed his "Collection of Obfervations on the Paintings and Sculpture which are to be feen in the principal cities of Italy." This work was very well received by the impartial part of the public, but the Italians, though delighted at difplaying their artiftic treafures to the eye of ftrangers, were neverthelefs indignant that any one fhould prefume to criticize them. Some Ciceroni have blamed the author for the fevere ftyle in which his criticifms are delivered. But however this may be, the work in queftion is, even at prefent, deemed the beft guide to travellers who wifh to attain a knowledge of the works of art in Italy. An excellent companion to this work is "Obfervations upon the Antiquities of Herculaneum, &c." by M. M. Cochin and Bellicard, which poffeffes the advantage of containing a great number of beautiful fubjects of antiquities engraved with great fpirit by the authors.

On his return to his native country this artift was created a chevalier of the order of St. Michael, defigner to the king, and fecretary to the academy of painting. Equally fkilful as an engraver, and as a defigner, his works amounted to above fifteen hundred fubjects, of which one hundred and twelve are portraits en medallion of the quarto fize, moft of which were of his friends, and other diftinguifhed artifts and men of letters.

The mode of art which he employed on his plates was chiefly etching, and his etching might be faid to confift almoft entirely of drawing, performed with tafte and freedom, and combined with a degree of picturefque feeling, which perhaps has never been exceeded. His beft landfcape, fancy, and hiftorical productions are as follow:

"The Death of Hypolitus," after J. F. de Troy, in folio. "David playing on the Harp before Saul," after Carlo Vanloo, in folio. "Abraham receiving Hagar by the Advice of Sarah," after the fame. "Grand Views of the Sea-ports of France," after Vernet, etched by Cochin, and finifhed by Le Bas, fourteen plates of large folio dimenfions. Sixteen large prints, reprefenting hiftorical fubjects of the Chinefe empire, defigned at China, and fent to Paris by the emperor, to be engraven.

The direction of this national work was committed to Cochin, who diftributed them, in order to be engraven under his aufpices, to the following artifts: J. Aveline, Aug. de St. Aubin, Ch. le Bas, J. P. Choffard, N. de Launay, L. Mufquelier, F. de Né, and B. L. Prevoft. Thefe fubjects were defigned by the Jefuit miffionaries, the father Attiret, firft painter to the emperor of China, Damafcenus Sikelbar, and Caftiglione. The prints being fent to China, as they were engraven and wrought off, proofs of them were not to be obtained by the public. Only a fmall number were referved for the royal family, and the king's library, but Helman the engraver executed a few copies of a fmaller fize. Cochin likewife engraved the following, which are chiefly after his own defigns. "The Infant Jefus holding a fmall Crofs." "The Virgin in the Attitude of a Magnificat." "The fmall Crucifix, to which the Convulfionaries attributed Miracles." "Lucius Quintus Cincinnatus," drawn from the antique ftatue, in 4to. "The Confecration of Louis XV. at Rheims," for the medallic hiftory by Godenoche, in 4to. "Decoration for the Illumination and artificial Fire Works in honour of the Dauphin, at Meudon, in 1736." Decoration for the Illumination and artificial Fire Works at Verfailles," 1739. "Perfpective view of the Illumination in the Rue Ferronerie, in 1739," all in folio. "Decoration of the Saloon, conftructed at Verfailles, for the Reprefentation of "The Princefs of Navarre," a comic piece, in honour of the nuptials of Louis Dauphin of France, with Maria-Therefa, Infanta of Spain, on the 20th of February 1745." Executed by Slodtz and Perot, defigned and engraven by Cochin. "Ceremony of the Marriage of the Dauphin with the Infanta of Spain, in 1745," engraven in 1746. "Funeral Obfequies of the Dauphinefs at St. Denis, in 1746." "Funeral Obfequies of the Dauphinefs in the church of Notre-Dame at Paris, 1746." "Funeral Ceremony of the King of Spain, in the Church of Notre Dame at Paris, 1746." "Funeral Ceremony of Catherine Opalinfka, Queen of Poland, in the Church of Notre Dame at Paris," defigned and etched by Cochin the fon, finifhed with the graver by J. Ouvrier, all in folio; and a fmall plate of a jeweller with a clufter of precious ftones, being the firft plate which he engraved from his own defign.

The beft portraits of Cochin jun. are Francifcus Benallus Tarvifinus, abbax, engraven in 1751. Louis de Boiffy, of the French Academy. Edme Bouchardon, fculptor, 1754. Count de Caylus, amateur. The abbé de Chauvelain, counfellor of the parliament. Charles Duclos, hiftoriographer. Pierre Jeliot, opera finger. The fame portrait finifhed by A. de St. Aubin. The marquis de Marigny, etched in 1752, under the title Marquis de Vaudieres, and finifhed in 1757 under that of Marigny. Pierre de la Place, of the Academy. The abbé Pommier, counfellor of the Parliament. Jean Reftout, painter of the Academy. A. L. Seguier, advocate general. The duke de la Valliere, of the Academy of Sciences. Prince de Turenne, amateur.

Of count de Caylus, who lived at the time now under our obfervation, his various antiquarian purfuits, his love of the arts, the fimplicity of his manners, and his irreproachable morals, we have already fpoken. (See the article CAYLUS.) His rank and reputation for fine tafte gave a degree of celebrity to his etchings which they do not intrinfically merit, and time, which is fure to overcome fafhion, has fince reduced them to the ftandard of mediocrity. It muft now be acknowledged that he could not, even with the affiftance of Bouchardon, draw with fufficient accuracy to etch from the fculptured gems of antiquity; though in imitating the fketches of the old mafters, and the grotefque heads of Leonardo da Vinci, he has been far more fuccefsful.

His prints are in general fmall, but very numerous. According to Mariette, they amounted to no fewer than three thoufand two hundred fubjects, of which we fhall proceed to name the principal. They are commonly marked either with the letter C. or in fome inftances C. de C.

Eighty-five plates of heads, after Leonardo da Vinci. Five large plates, after Della Bella. Upwards of two hundred plates from drawings and fketches by the old mafters, formerly in the cabinet of the king of France. A collection drawn from antique gems by Bouchardon, etched by C. de C., and finifhed with the graver by Le Bas, on ten quarto plates. Six large plates of mythological fubjects, compofed by Bouchardon, etched by C. de C., and terminated

nated with the graver by Et. Feſſard. A collection of heads (conſiſting of thirty of the quarto ſize) from the drawings of Rubens, or Vandyke, or both theſe maſters, in the Crozat collection; and "The Aſſembly of Brokers," a humorous print, in quarto.

The following portraits are alſo from the etching-needle of Count Caylus, namely, Michael Maſciti, in a medallion, dated 1726. The abbé le Gendre. Camille Falconet, a phyſician of Lyons. Polidore da Caravaggio, and Voltaire in the Baſtile; all of them ſmall plates.

Louis Surrugue, the elder, was born at Paris in 1695, and died in the ſame city in 1769. He learned the principles of deſign and of engraving under P. Picart, whoſe manner he ſucceſsfully imitated. His ſtyle is, on the whole, commendable, and he was one of thoſe artiſts who combined with good effect the etching-needle and the graver. Surrugue furniſhed ſome very good prints to the greateſt number of the collections which appeared during his time.

He was a member of the Royal Academy, and engraved portraits and hiſtory with equal ſucceſs. The following are the ſubjects of his principal works:

"St. Marguerite trampling an enormous Dragon under foot," after Raphael. "St Jerome ſitting in the Deſart, in profound Meditation" after Balthaſar of Sienna, engraven by Nicolas Chateau, and retouched by Louis Surrugue. "Jeſus curing Ten Lepers," after Jerome Genga. "Abraham offering up Iſaac," after the celebrated painting of Andrea del Sarto, in the gallery of Dreſden. Theſe four are in folio. "The Nativity of the Virgin," after P. da Cortona, in quarto. "Moſes breaking the Tables of the Law," after Pouſſin. "Hagar diſmiſſed by Abraham," after Euſt. le Sueur, engraven in 1711. "Protection granted to the Fine Arts," after Le Brun. "Deſcent of Æneas into Hell," after Ant. Coypel. "Economy," after a painting of Chardin, in the cabinet of the king of Sweden, being a companion to "The Amuſements of Private Life," in the ſame cabinet. "Amuſements of Cytherea," after Watteau. A Pair after the ſame: "A Scene in an Italian Comedy," and "A Concert of Muſic." "The Deſire of Pleaſing," after J. B. Pater. "The Pleaſures of Summer," after the ſame. Two ſubjects from the comic romance of Scarron, entitled "Madame de Bouvillon, in order to tempt Fate, bids him ſeek her a Flea;" and "Ragotin eſcaping from a Cheſt," after the ſame painter, and of the upright form. "Diverſions of the Dutch Peaſantry," after D. Teniers, engraven in 1748. "David Teniers cauſing his Wife's Fortune to be told," after the ſame. "Silvia in expectation of her Lover," after a painting of Santerre from an idea of Rembrandt. "The Philoſopher in Meditation," and "The Philoſopher in Contemplation," two ſubjects after Rembrandt. "Venus nouriſhing the Loves," after Rubens, a compoſition alſo engraven by C. Galle, and by H. Watelet. The above ſubjects are all in folio.

Surrugue alſo engraved two portraits, as appears to have been the cuſtom, for his admiſſion into the Royal Academy, of the following artiſts, Louis de Boullongne, the father, painter to the king, after Mathieu. Joſeph-Chriſtophe Veirier, a Provençal ſculptor, relation and pupil of P. Puget, both in folio.

Pierre-Louis Surrugue, the ſon, was born at Paris in the year 1717. He acquired the elements of his art under the paternal roof. His ſtyle of engraving greatly reſembled that of his father; like him he was a member of the royal academy, and like him alſo he engraved both portraits and hiſtorical ſubjects, of which the following are thoſe of moſt importance. Excepting a pair of quarto landſcapes after Teniers, they are all of the folio claſs.

"The Nativity of our Saviour," after the celebrated painting of Correggio, known under the name of la Nuit de Corrige. "The Virgin and Child accompanied by St. Jerome, St. Criſpin, and St. Criſpinian," after Guido. "The Judgment of Paris," after H. Goltzius. "The Converſation," and "The Gypſey in Bed," two Flemiſh ſubjects after Teniers, engraven in 1748. "Two Flemiſh Landſcapes," after the ſame, engraven in 1750, in quarto. "Clytie changed into a Sun-flower," after Ch. Coypel. "Orlando learning the Flight of Angelica from the Shepherds." "Deſign of a Saloon at St. Cloud, repreſenting the Apotheoſis of Hercules," both from Ch. Coypel. A pair after B. S. Chardin, entitled "The Monkey Painter," and "The Antiquary (an ape) in the midſt of his Curioſities." "The Blind Man," with ſix French verſes, is from the ſame painter.

His beſt portraits are in folio, and are thoſe of Simon Guillain, ſculptor to the king, after N. Coypel, engraven by P. L. Surrugue for his reception into the academy in 1747. René Fremin, director of the academy of painting, after de la Tour, engraven by Surrugue the younger for his reception into the academy in 1747. Madame de * * * in a ball dreſs, after Ant. Coypel. This anonymous portrait was falſely underſtood to be that of Madame de Pompadour, but is that of Madame de Mouchi; and Rembrandt the father, painted by the ſon.

Jacques-Gabriel Huquier, the father, was born at Orleans in 1695, and died at Paris in 1772. In conjunction with his ſon, this artiſt etched a great number of prints after Gillot, Watteau, Boucher, and other French maſters. He was a print merchant, and carried on a conſiderable trade, and at his houſe the artiſts and amateurs of Paris were accuſtomed to meet on certain evenings, and converſe for their mutual pleaſure and improvement.

Huquier was a man of taſte, well informed on ſubjects connected with the fine arts, and at his death left an immenſe collection of prints and drawings of great value, which were ſold by public auction. We begin our ſelection of his beſt works, with thoſe which he has engraven after Watteau, which are all of the folio claſs.

A ſet of five plates entitled "The Senſes." A pair of the gardens of Cytherea and Bacchus. The following are alſo publiſhed in pairs, "The Temple of Bacchus," and "The Temple of Neptune." "Apollo," and "Diana as a Huntreſs." "The Faithful Gardener," and "The Ardent Shepherd." "The Cradle," and "The Theatre." "The Triumph of Galatea," and "The Shepherd overtaken by a Storm." "The Emperor of China," and "The Chineſe Divinity." A ſet of four plates of the ſeaſons, expreſſed by Paſtorals; and another ſet of the four elements.

His beſt prints after Boucher are two books of ſtudies, four plates in each. A book of academical figures. Four ſets of Paſtorals, ſix prints in each. Four plates of Chineſe ſubjects;—but Boucher is always temporary or trifling.

From his own deſigns he has engraven one hundred and eight plates, conſiſting of ſix hundred ornamented vaſes, another book of ornaments, and a grand iconology, or collection of allegorical vignettes, repreſenting arts and ſciences, heathen deities, virtues, vices, &c. on two hundred and ſixteen plates; and a collection of antique figures from drawings by Oppenort, whoſe portrait he has alſo engraved.

Gille Edme Petit was born at Paris in the year 1696, and died in the ſame city in 1760. He was the diſciple of Jac. Chereau, and his ſtyle of engraving greatly reſembled that of his maſter. To him we are indebted for a conſiderable number of portraits, of which the following are the principal,

pal, executed with great neatnefs ; and, as is believed, almoft entirely with the graver.

Prince Charles Edward Stuart, from a picture painted at Rome by Dupré. Philibert Papillon, canon of the chapel of Riche, at Dijon. Pierre Bayle, the celebrated critic. Marie de la Fontaine, of La Boiffiere, after De la Tour. Louis Philhpe, regent of France, after Liotard. Maria Therefa, queen of Hungary, after Meytens. René Charles De Maupeou, firft prefident of the parliament, after Chevalier. Armand Jules, prince de Rohan, archbifhop of Rheims, after Rigaud. Henri-Charles de Pomponne, abbé of St. Medard, after J. B. Vanloo. Jean-Frederic Philippeaux, count de Maurepas, after L. M. Vanloo. Joachim-François-Bernard Potier, duke de Guefvres, after the fame, engraven in 1735. Francis I., king of France, after Titian, engraved for the Crozat collection ; and Louis XV., king of France, after Carlo Vanloo.

The following are from the pictures of Frere Jean André. "The Pilgrims of Emaus." "The Vifitation." "The Virgin with her Rofary." and "St. Catherine of Sienna." The above fubjects are all in folio.

Pierre Subleyras was born at Ufez in 1699, and died at Rome in 1749. At the age of fifteen he was fent to Touloufe, and placed under the care of Antoine Rivalz. At twenty-one he vifited Paris, and obtained the firft prize of the Academy, of which the fubject was the brazen ferpent. In confequence of this, he was appointed by the French Academy to go to Rome, where he remained for fome time, and completed his ftudies. The manner of living in this city being agreeable to his mode of thinking, he finally fettled in it, and efpoufed fignora Maria-Felice Tibaldi, a celebrated minature painter. Subleyras compofed with great facility, and drew correctly. He poffeffed a brilliant reputation, though he died at the age of fifty, and the great number of his pictures, which were to be found both in Rome and the other Italian cities, bears teftimony to his genius, and the fertility of his imagination.

Subleyras etched fome fubjects from his own compofitions; and is among the number of thofe painters who have handled the etching-needle with great tafte and fpirit. His choice of fubjects is excellent.

We may here mention, as favourable fpecimens of his talent as an etcher, the following prints :

"The Brazen Serpent," for the prize of the Academy. "The Martyrdom of St. Peter." "Jefus at Supper in the Houfe of the Pharifee, with Mary Magdalen at his Feet." Four fubjects taken from La Fontaine's Fables.

Bernard Lepicie was born at Paris in 1699, and died in the fame city in 1755. At his death he enjoyed the title of perpetual fecretary and hiftoriographer to the Royal Academy, and profeffor of hiftory to the eftablifhment for the inftruction of pupils.

In engraving he appears to have ftudied in the fchool of Jean Audran, whofe ftyle he fuccefsfully imitated. His drawing is not very correct, though it muft be admitted that many of his prints are not deftitute of merit. He vifited England, being invited hither by Dubofc, and during his ftay, affifted Dorigny in engraving the Cartoons of Raphael at Hampton Court.

In his capacity of hiftoriographer to the Academy, he publifhed two works, having for their titles : "Defcriptions of the Pictures of the King ;" and "The Lives of the firft Painters to the King, from Charles Le Brun, to François Le Moine."

The prints of this artift confift of hiftorical fubjects, and portraits of the folio clafs, and are principally as follow :

"The Circumcifion ;" "Jupiter and Juno ;" and "Jupiter and Io ;" after Julio Romano. "St. John preaching in the Wildernefs," after J. Baptifte Gauli, furnamed the Drunkard. "Vertumnus and Pomona," after Rembrandt. "An old Woman telling a young Girl's Fortune." "The Flemifh Philofopher," engraven in 1744 ; and "The Flemifh Freemafons in their Lodge," both after Teniers. A pair entitled, "The Game of Chefs," after Carlo de Moer, dated 1746 ; and "The Game of Picquet," after Gaf. Netfcher. Another pair after the fame, entitled "Love in a City ;" and "Love in a Village." "Thalia expelled by Painting," after Ch. Coypel. "The Loves at their Toilette," after the fame. "Ceres afleep," after Fr. Boucher. "The Breakfaft," after the fame. "Cupid bird-catching," and "Cupid reaping," two prints after the fame. "A Bafhaw caufing his Miftrefs to be painted," after Carlo Vanloo. "Charles I. taking leave of his Children," after Raoux. "Monument to the Memory of Bayle, Locke, and Sydenham," after Creti, Ferraivoli, and Mirandot, conftituting one of the nine prints engraven in England by Lepicie, and other French engravers.

The beft portraits by this artift are thofe of Nicolas Bertin, painter to the king, painted by Lien, and engraven by Lepicie for his reception into the Academy in 1740. Louis de Boullongne, firft painter to the king, after H. Rigaud. Philibert Orry, minifter of finance, after the fame. Pierre Graffin, director general of the mint, after Largilliere. Claude Capperonnier, librarian to the king, after Aved. Antoine de la Roque, an old military officer, repofing in a landfcape adorned with nymphs and fawns, after Watteau. Charlotte Defmares, as Thalia, after C. C. (Charles Coypel). Catherine de Seine, in the character of Cleopatra, after Jac. And. Aved. Frances d'Aubigny, marchionefs de Maintenon, after Mignard. Jean Baptifte Moliere, after Charles Coypel.

Renée-Elizabeth Marlie, wife of Bernard Lepicie, was alfo diftinguifhed as a French engraver. Her beft works are,

"Youth feigning Decrepitude," engraven in 1751. "Benedicite ;" and "The laborious Mother," after S. Chardin, two plates. "The Flemifh Cook," after D. Teniers, engraven in 1748.

Marie Jean Dubos, the pupil of Charles Dupuis, was born in the year 1700. She fuccefsfully imitated the ftyle of her inftructor, and engraved feveral plates in the courtly work, which is entitled "Verfailles Immortalifé," and which appeared at Paris in the year 1720, in two quarto volumes. The following pair of folio prints are alfo from her hand : "A young Girl careffing a Rabbit," after S. Baffeporte ; and "A Girl with her favourite Cat," after P. P. A. Robert.

Jean Hauffart, or Hauffard, was born at Paris in the beginning of the eighteenth century. The time of his death is not mentioned ; neither is it known under what mafter he ftudied, but he imitated, with much fuccefs, the ftyle of Benoit Audran. His drawing was correct, and the greateft number of his prints executed with confiderable tafte. The productions which do him moft honour are thofe which he engraved for the collection of Crozat, among which are the following :

"Jupiter and Semele," after a cartoon of Julia Romano. "The Creation of Eve," after the fame painter. "Virtue," an allegorical fubject, confifting of five figures, after Siciolante Sermoneta. "Jefus expelling the Venders from the Temple," after Barth. Manfredi. "Topers affembled round a Table ;" and "Mofes ftriking the Rock," both after Fr. Romanelli. "Dives and Lazarus," after Dom Feti. "The Four Ages," defigned by Hauffard himfelf. "The Virgin holding the infant Jefus ftanding on her Knees,"

in a border of rofe-trees, with the infcription "Rofa myftica," de la Foffe pinx. "The Metamorphofis of Syrinx," after Jac. Courtin, all in folio.

Jean Charles Flipart, the elder, was born at Paris A.D. 1700, or thereabout, and died in the fame city, but the time of his death has not been mentioned. His ftyle is neat, but deficient in the more important requifites. The two which immediately follow, and which he engraved after Raphael for the Crozat collection, are probably his beft performances. "The Virgin and Child;" and Jefus at Prayer on the Mount of Olives;" both fmall upright folios.

He alfo engraved, but without any confiderable fuccefs, "A Magdalen," after Ch. Le Brun; and "Apollo purfuing Daphne," after René Houaffe, in 4to.

Jean Jacques Flipart, (the fon,) was born at Paris in 1723, and died in the fame city in 1782. Never did any artift, according to Bafan, poffefs more modefty and difintereftednefs than the junior Flipart, and with thefe qualities were united a confiderable portion of profeffional talent. His earlier prints are executed in a comparatively open ftyle, with few croffings, but afterwards, adopting the opinion of Watelet, that the white intervals between the lines of an engraving were more or lefs unfavourable to the repofe of a print, he changed his principle, and began to advance his plates by means of etching, croffing his work frequently with fecond and third courfes of lines, and filling up the interftices which ftill remained with dots, fo that upon the varnifh, and before his plates were bit-in, they had a very finifhed appearance. Had he corroded thefe etchings to a fufficient depth, he would have fpared himfelf much time and labour: inftead of which he bit them in but lightly, and proceeded to finifh by re-entering his etched lines with the graver. In this manner, however, he executed feveral excellent prints which combine good drawing with effective chiaro-fcuro, and among which the following, which are moftly of the folio dimenfions, are juftly held in efteem:

"A Holy Family," after Julia Romano. "Adam and Eve in the Prefence of the Eternal after their Fall," after Charles Natoine. "Venus prefenting Arms to Æneas," after the fame. "The young Corinthian," after J. B. Vien. "The Virtuous Athenian," after the fame, an upright. "The Paralytic Father, furrounded and attended by his Children," after the fame. "The Village Bride," after J. B. Greuze, engraven in 1770. A beautiful compofition, and finely executed. "The Cake at the Feaft of Kings," after the fame, engraven in 1777; a grand compofition. "The Tempeft, or a Shipwreck during the Day," after Vernet. "The Tempeft, or a Shipwreck during the Night," after the fame, engraven in 1771. Thefe two large prints are ably executed, and produce a grand effect. "Our Lord curing the Paralytics," after Dietrichy. "Bear-hunting," after Carlo Vanloo. "Tiger-hunting," after Boucher, being a companion print to the preceding. "The Combat of the Centaurs and the Lapithæ," after a painting of L. Boullogne, engraved for the reception of Flipart into the Academy.

His beft portraits are thofe of Jeanne du Ronceray, wife of Favart, drawn by Cochin, in quarto. Jean Baptifte Greuze, drawn by himfelf, and engraven by his friend Flipart, in quarto.

Flipart has likewife engraven with much tafte feveral vignettes and ornaments for books. He had a younger bother, Charles François, who died in 1773, and who executed fome fmall prints after Fragonard. Jofeph Flipart, who is believed to have been of the fame family, was engraving at Venice in 1740, for Wagner.

The only production of his with which we are acquainted is a concert with four Italian verfes, infcribed Jofeph Flipart pinx. et fc. Wagner exc.

Laurent Cars was born at Lyons in 1702, and died at Paris in 1771. He was the fon and pupil of Jean François Cars, who had engraven a few portraits, &c. and when very young, accompanied his father to Paris. At firft he applied himfelf to painting, but in a very fhort time relinquifhed this art, and ever afterwards dedicated his time to engraving, in which he made great progrefs.

Cars has been regarded by Watelet, and other excellent judges, as one of the beft engravers of the eighteenth century. He executed his prints in a very different, though perhaps not in a preferable ftyle to that of the preceding age; but though it might not have been equally fuitable to the paintings, after which thofe mafters engraved, yet it was naturally fuggefted to the mind of Cars by engraving after Le Moine. The pictures of the great mafters of Italy, particularly Le Seur, Le Brun, Mignard, &c. poffeffed a degree of harfhnefs which would have been but ill expreffed by the fafcinating mellownefs which Cars introduced even into his fhadows. In the productions of J. Audran, picquancy predominates in the half tints, while in Cars', it is in the fhadows. His chef d'œuvres are thofe which he engraved after Le Moine, and efpecially Hercules with the diftaff.

The engravings of this very meritorious artift are numerous, and in general large. The following are thofe more particularly worthy the notice of connoiffeurs:

"The Adoration of the Shepherds," and "the Flight into Egypt," both after Carlo Vanloo. "The Tranfgreffion of David," after J. F. de Troy. "The Chaftity of Sufanna," after the fame. "The Blind Man duped," after J. B. Greuze. "The Mother with Three Children," after the fame, etched by L. Cars, and finifhed with the graver by A. D. Jardinier. "Adam and Eve before their Tranfgreffion," after Fr. le Moine. "Adam and Eve after their Tranfgreffion," a companion print to the preceding, after Ch. Natoire. "The Bather," a nymph entering the water, after Le Moine, who was alfo the painter of the following eight fubjects: "Time carrying away Truth." "Hercules fpinning before Omphale," a diftinguifhed piece. "Perfeus delivering Andromeda." "Iphigenia about to be facrificed, is refcued by Diana." "Hercules victorious over the Robber Cacus," painted by le Moine for his reception into the academy. "Cephalus carried away by Aurora." "Jupiter and Europa." "An allegory on the Fruitfulnefs of the Queen." "Louis XV. taken out of the Hands of Women, and placed under the Care of Men," after Fr. Boucher. "Monument in honour of the Duke of Marlborough," after the fame. "The Fortune-teller." "A Venetian Feftival," and "An efcort of Equipages," all after Watteau.

The moft diftinguifhed portraits from the graver of Cars are thofe of Michael Anguier, fculptor to the king, painted by Gab. Revel, and engraven by L. Cars, for his reception into the academy in 1733. Armand Gafton, cardinal de Rohan, after H. Rigaud. Pierre d'Hozier, genealogift of France. Maria, princefs of Poland, queen of France, after C. Vanloo. Louis vifcount d'Aubuffon, duke de la Feuillade. Gafpar de Real, Chevalier. François Boucher, firft painter to the king. Jean Baptifte Simeon Chardin, painter. Frances Marguerite Pouget, wife of Chardin. Pierre Perault, librarian. Sebaftian Antoine Slodts. Paul Ambroife Slodts. Michael Angelo Slodts. Jacques Germain Soufflot, and Carlo Vanloo painter, all after the junior Cochin; Mademoifelle Camargo, after Lancret, and Madame Clairon in a dramatic character.

Jean Daulle was born at Abbeville in the year 1703, and

and died in the city of Paris in 1763. He acquired the rudiments of his art in his native city from an obfcure engraver of the name of Robert Hecquet, and afterwards vifiting Paris for improvement; he there fo far diftinguifhed himfelf, as to be admitted a member of the French academy in the year 1742. Strutt fays he worked entirely with the graver, and his performances fufficiently manifeft the great command he had of that inftrument. His ftrokes are laid with much freedom, yet without any affectation. They are very clear, and produce a pleafing harmonized effect. Had his knowledge in drawing been equal to his management of the mechanical part of his engravings, they would have ranked with the firft performances the world ever produced; and from the French writers we learn that the fate of Daulle was that of too many of the engravers of our own country; he was obliged, in order to obtain a fubfiftence, to practife that kind of art for which he was leaft qualified by nature, and neglect that in which he would probably have attained to higher excellence. Watelet praifes highly his portrait of the countefs of Feuquieres, who is reprefented holding the portrait of Mignard the painter; and his moft efteemed hiftorical engravings, which are of the folio clafs, are thofe which follow:

The celebrated recumbent Magdalen of Corregio, engraved for the Drefden gallery. "Diogenes with his Lantern," after Efpagnolet. "The Two Sons of Rubens," ftanding figures, after that painter. "The Quos Ego, or Neptune allaying the Tempeft," from Virgil, after Rubens, a large plate. "A Charity with Three Children," after Albano. "The Triumph of Venus," after Boucher. A pair of prints dedicated to Madame Pompadour of "The four Seafons," after the fame. "The Vengeance of Latona," after J. Jouvenet, engraven in 1762. "Jupiter and Semele," after P. de Mathieu. "The Myftery of the Rofary," with the infcription, "Meditez ces Myfteres," after Frere Jean Andre. "The Turk regarding Fifhing," after Vernet, and from the fame painter. "The Grecian leaving the Bath." "Occupations in Port," and "The Pilgrimage." "The Death of Abel," after Dietrich, engraven in 1761. "Villagers on the Banks of a River," a landfcape after the fame. "Repofe of Venus and the Graces at the Bath," after J. Raoux. "The Dutch Churner," after the fame. "The Magic Lantern," after M. Pierre. "Love on Foot," after Ch. Coypel. "Jupiter under the Form of Diana, enamoured of Califto," after Pouffin. "La Favart, in the Character of Baftienne," after Carlo Vanloo.

The moft efteemed portraits by Daulle are thofe of Catherine Mignard, countefs de Feuquieres, holding the portrait of her father. P. Mignard pinx. J. Daulle, fc. 1735. His firft work of importance, Hyacinthe Rigaud feated at his eafel, painting his own portrait, and that of his wife, engraven by Daulle for his reception at the academy, in 1742. Margaret de Valois, countefs de Caylus, after Rigaud. Claude Defhais Gendron, doctor of medicine, after the fame. Charles Edward Stuart, eldeft fon of the Pretender, without his name, the head painted by an anonymous artift, and the drapery by Rigaud, engraven in 1744. Clementina, princefs of Poland, (wife of the Pretender,) after David; this and the preceding are both rare prints. François Febure de Lembriere, bifhop of Soiffons, engraven 1736. François Patot, abbé of St. Genevieve. F. D. Emanuel Pinto, grand mafter of Malta, engraven in 1744. Gerard Moerman, counfellor and fyndic of Rotterdam, after Perronneau, engraven in 1753. Portrait of Gauffecourt of Geneva, (which his friend Rouffeau caufed to be engraven at Paris,) painted by Nonnotte, engraven by Daulle 1754. Charles-Alexander de Lorraine, after Meytens. Jean Baptifte Rouffeau, after J. Aved. Pierre Louis Moreau de Maupertuis, an hiftorical portrait, after R. Tourniere. Mademoifelle Pelifier, an opera actrefs, as Flora, after H. Drouais. Buft of Frederic-Guftavus III. king of Poland, painted at Drefden by Silveftre, engraven by J. Daulle engraver to the king, and Jean Mariette, engraver, after Pefne, all in folio.

Jacques Philippe le Bas was born at Paris in the year 1708, and died there in 1782. He was the difciple of N. Tardieu, and diftinguifhed himfelf at an early period of life by producing a great number of beautiful prints, confifting of landfcapes, and of landfcapes peopled with fmall paftoral or domeftic figures, fuch as thofe of Wouvermans and Teniers, which depend, for the intereft they excite, rather upon an animated and expreffive touch, than upon the anatomical or academical prowefs difplayed in their outlines.

Watelet endeavours to account for the early and extenfive reputation of Le Bas, than whom no engraver in Europe was better known, by fuppofing it to have been owing to the great number of prints to which he affixed his name, many of which he allows were of inferior merit and the work of his pupils. "Fully perfuaded," (he fays,) "that a very fmall number of real connoiffeurs exifted, Le Bas conceived, that he would be deemed the beft artift who put his name to the greateft number of plates; and the great reputation he acquired evinced that he had not been deceived. But his fame would have been more lafting, had he acknowledged only thofe engravings which were begun by his beft pupils, and which he himfelf terminated. Le Bas, however, merits a diftinguifhed rank among thofe artifts who have been defervedly celebrated for their tafte. His finifhing touch, and piquant, and fpirited ftyle, imparted animation and grace even to thofe prints, which in other refpects were but of inferior execution. He was the firft, after Rembrandt, who made much ufe of the dry point, and his pupils have fince brought the ufe of that valuable tool to ftill greater perfection.

There is certainly much truth in thefe obfervations of Watelet; Le Bas was probably the moft manufacturing engraver that had yet appeared in Europe, employing fome of his pupils entirely upon the fkies in his plates, others entirely upon trees, others upon etching figures, and fo forth, and did more than any of his predeceffors to bring down his art to the level of a trade; but it is alfo to be remarked that he had under his roof fome pupils, or rather journeymen, of the very firft tafte and talent, among whom were Aliamet, Ryland, Laurent, and others who are probably ftill living.

Poor Laurent was an Englifhman who died in Paris of a confumption; almoft the whole of whofe works appeared under the name of Le Bas. He was a man whofe chemical knowledge enabled him to improve the etching varnifhes in ufe at the time, and whofe profeffional tafte and feeling were of the moft exquifite kind. He etched the large boar hunt and hawking fubject, after Wouvermans; the witch of Endor, after Salvator Rofa, fome large and fine plates after Berghem, and feveral other of the very beft plates that appear with the name of Le Bas.

Le Bas was a man of focial habits and manners, and good addrefs, yet his profeffional induftry was great, and the lift of his works numerous, from which the following are felected.

A book containing eight quarto plates of military figures. A book containing eight quarto plates of fafhions; a pair in 4to. entitled "The Villagers," and The "Vintagers,"

a pair

a pair in 4to. entitled "Time ill employed," and "The Lover beloved," with ſome other ſubjects of trifling importance for his own deſigns.

From thoſe of other artiſts he has engraven the portraits of Robert le Lorrain, ſculptor to the king, painted by Drouais, engraven by Le Bas for his reception into the academy in 1741. Pierre-Jacques Cazes, painter to the king, painted by Aved, engraven by Le Bas for his reception into the academy in 1741. A ſet of four plates of the times of the day, after N. Berghem, very fine prints, at leaſt two of which were etched by Laurent. "The Return to the Farm," and "Embarkation of Stores," after the ſame maſter. "The Flander's Courier," a landſcape, after Andrew Both. "Ancient View of the Rhine at Coblentz," after Berghem and J. Both. "Ancient View of the Canal at Amſterdam," after the ſame artiſts. "Agreeable Solitude," after Boucher. "Firſt and Second Views of Beauvais," after the ſame. "Firſt and Second Views of Charenton," after the ſame. "Fiſhmonger of Chevelingue," after P. F. Bout. "Firſt and Second Views of the Environs of Lerida," after B. Breemberg. Two Swiſs views, "The Caſcade of Piſſevache," and "A Part of the City of Fribourg, with the Houſe of the Jeſuits," after the ſame. "Two Views in the Pays-Bas, the "Three Mills," and "The Road to Flanders," after Breughel. Two military views, "Diſtribution of Dry Forage," and "The Removal of a Camp," after J. Chantreau. Four prints after Chardin, "The Morning Toilette." "Study of Deſign." "Good Education," and "Economy." "The Dutch Menage," after Oſtade, engraven in 1771. "Dutch Amuſements," after the ſame. "Grecian Ruins," after Pannini. "Rudera near Sans-Souci," after the ſame. "Departure for the Italian Hunt." "An Italian Dance." "Halt of French Troops." "Halt of Swiſs Guards," and "An Encounter of Cavalry," after Wouvermans.

The four following are after Poelenbourg; namely, "The ancient Baths at Vaucluſe;" "Ancient Aqueduct at Preneſte," and a pair of ruined edifices in Etruria. From Pynaker we find a "Landſcape with Cattle," from Ruyſdael, a "Dutch Mill," engraven in 1747, and a pair which are views of Schevelingen and Haerlem, (the latter engraven in 1753,) from Sal. Roſa. "The Augurs," and from Watteau, "The Gamut of Love;" "The Faſhionable Aſſembly;" and "The enchanted Iſland."

Le Bas' engravings after Teniers exceed an hundred, many of which are treated in a taſte peculiarly characteriſtic of that admired maſter. Judgment in finiſhing was the forte of this engraver, and the addreſs with which he rendered what others had done, ſubſervient to a final purpoſe, has not ceaſed to be the ſurpriſe of profeſſional men, who ſtill talk of the magic of Le Bas' finiſhing touch. We cannot of courſe enumerate all the prints that he has produced after Teniers, and believe the following will be found among the beſt:

"David Teniers and his Family." "The Works of Mercy," a large and very fine plate. "The Prodigal Son," a companion print to the preceding. "Flemiſh Rejoicings," a beautiful landſcape, in which Teniers has painted himſelf and family. Theſe four are of very ſuperior execution, and we may add to them his grand views of Flanders, and his beautiful village fetes.

His large works from Wouvermans are alſo of the firſt order, and the chief of them entitled as follow:

"The Pot of Milk;" "The Italian Chaſe;" "The Boar Hunt," engraven in 1741, beautifully etched by Laurent. "Halt of Cavalry;" "Halt of Officers," engraven in 1740, companion to the former. After N. N. Coypel he has engraven a pair, entitled "The Bath of Diana;" and "The Alliance of Bacchus and Venus." Another pair, "Hermitage, two leagues from Fribourg in Saxony;" and "The Environs of Fribourg;" are after Dietrichy. "The Fine Morning;" and "The Beautiful Afternoon;" two landſcapes after C. Dujardin. "Departure for the Chace," is after Ch. Van Falens, engraven in 1742, as are the following pair: "A Hunting Rendezvous;" and "The Fortunate Hunter." After Lancret he has engraven Grandval, a celebrated comedian, and "Gallant Converſation;" the latter for his reception at the Academy in 1743. A beautiful print, "Mademoiſelle Dangueville, as Thalia, ſurrounded by various comic Figures," after J. B. Pater. "The ancient Port of Meſſina," after A. Lorrain. "The Villager's Reward," a rich Italian landſcape, after the ſame. "An Italian Sea-port," after Joſeph Vernet, painted at Rome. From the ſame maſter are, "Setting out to fiſh;" and a ſeries of French ſea-ports, in ſixteen very large prints, begun in 1760, and finiſhed in 1776. Theſe plates were engraven conjointly by Cochin and le Bas, excepting the two laſt, the port of Dieppe, and that of Havre, which were finiſhed by M. Martini in 1780. Two Flemiſh prints, "The Reapers," and "The Reapers' Repaſt," after Michault. Two Flemiſh ſubjects on one plate, "The Pleaſures of Noblemen;" and "The Pleaſures of Peaſants." "The Preaching of St. John in the Deſart," after P. F. Mola. "View between the Hague and Rotterdam," after A. Vanderneer. "Winter Diverſion on the River Schie, near Delft," after the ſame. "Day-break," after Ad. Vandevelde, engraven in 1773; and "The Royal Hunt," after the ſame maſter.

Quintin Pierre Chedel was born at Chalons, in Champagne, in 1705, and died in that province in 1762. He had been a ſtudent in literature in his youth, but having repaired to Paris, inſtead of continuing his literary ſtudies he delivered himſelf up to his natural taſte for deſign and etching, in which he was ſingularly ſucceſsful. He was much employed by the bookſellers, but having injured his health by his great aſſiduity in his profeſſion, he returned to his native province, in order to ſpend the remainder of his days. His works were extremely numerous, a few of which we ſhall only mention. Portrait, in a medallion, of Claude de l'Iſle, hiſtoriographer to the king. Portrait, in a buſt, of Nicolas de la Brouſſe, count de Verteillac &c. The ſix days of the Creation, ſix ſmall prints in the form of vignettes. Fourteen ſubjects from the Old Teſtament, of the ſame form. Series of battles in the form of vignettes, fifty-nine prints: Six ſmall plates, marked "Obſervations Aſtronom." Six ſmall landſcapes numbered, on the firſt is inſcribed "Sejour paſtoral." Six plates of landſcapes, inſcribed to the marchioneſs of Pompadour. Military fetes, dedicated to count Turpin de Ceiſſe, &c. ſix prints. Six beautiful prints numbered, of military events. Two rural prints, *viz.* "The Village Wedding," and "The Country Feſtival." Two prints of ruined edifices, entitled "Ruines de Cumes." Two ruſtic ſubjects, the one repreſenting "A Repaſt," the other "A Dance by Peaſants." Two incendiary ſubjects, "The taking of Troy;" "The Burning of a City." Two landſcapes, "The Neſt," and "The Caſcade." Two prints entitled "Views of the Works of the Bridge of Orleans." Six prints of rock work, under the title, "New Whims." P. Q. Chedel ſculp. aqua forti. "T. Q. Flaminius giving Peace to Greece."

Various ſubjects after different maſters: Two marine prints, entitled "The Fiſhers," after Adam Willaers. Four military actions, entitled "Various Skirmiſhes of Cavalry,"

valry," after Vandermeulen. Four landſcapes adorned with ruins, grottoes, and huts, after Boucher. Four views drawn from nature, by Boucher. Two landſcapes, "View of the Bridge of Lavandieres, in the Æos Païen;" "View of the Devil's Tower, near Blois." Two landſcapes, "The Watering-place for Birds," and "The Dove-houſe," after the ſame. Two landſcapes, "The Fiſher," and "The Ruſtic Bridge," after the ſame. "The Anchorite," a grand landſcape after Boucher. "Hermits in a Deſert," after Pierre. "A Landſcape, in the middle a chateau, and in the fore-ground two cows and a cow-herd repoſing," after the ſame. "A Landſcape, in the middle a Church, and in the fore-ground ſome Cattle," after the ſame. "A marine Piece, in the middle are ſome ruſtic Houſes, on the fore-ground a Man watering his Horſe, and ſome Mariners in port," after the ſame. Two architectural ſubjects, with figures, after Bibiena. Four landſcapes, after Teniers; "Morning Labour;" "The Hour of Dinner;" "The Afternoon;" "The good Night." "The Dawning of Aurora," a beautiful landſcape after Teniers. "General Quarters, adorned with a number of Figures," after Robert Van Hoek. "Sale of Fiſh at Schevelinghe," after Jean Breughel.

Jean Jacques Balechou was born at Arles in the year 1715, and died at Avignon in 1764. "This extraordinary artiſt worked entirely with the graver, and was perfectly maſter of that inſtrument. The clearneſs of his ſtrokes, and the depth of colour which he produced, are far beyond any productions prior to his own. But he did not draw well:" (thus ſays Strutt,) "and on this account" (and on account alſo, we may add, of his not practiſing the art of etching,) "his prints want that freedom, harmony, and correctneſs," which is eſſential to the perfection of engraving. With all his beautiful clearneſs of manual execution, his fleſh appears metallic, his rocks rather reſemble ice, and the foam of his agitated ſea ſome thick and "lazy-pacing" liquid. His moſt juſtly celebrated work is a large ſtorm and ſhipwreck after Vernet, to which theſe remarks are chiefly applicable: but then here is a tempeſt-torn ſky where the dark clouds are admirably engraved, and here is water in its liquid ſtate, expreſſed with ſo much of the truth of nature, that while it left the predeceſſors of Balechou at an immenſe diſtance, has been the ſchool of Woollett, Byrne, and all thoſe who have ſubſequently attempted to diſtinguiſh themſelves in expreſſing the genuine character and appearance of the ſea when agitated by a tempeſt.

Watelet criticiſes our engraver ſomewhat ſeverely for the ſurreptitious brilliancy of execution which he has been too ſolicitous to diſplay, and which in his "Calm," after Vernet, and "St. Genevieve," after Carlo Vanloo, are certainly miſapplied. Good impreſſions of his engravings are, however, highly valued by collectors.

The moſt numerous part of the engravings of Balechou are his portraits: his hiſtorical works, which are of the folio claſs, are but few in number, and are principally as follow:

"Birth," and "Infancy," a pair, after Dandre Bardon. Three plates, of which the titles are unknown to us, after Etienne Jeaurat, "St. Genevieve," after Carlo Vanloo, a large upright. "The Tempeſt," after Joſeph Vernet. "The Calm," after the ſame. Theſe are all in folio, and the two laſt very large.

His beſt portraits are thoſe of Anne Charlotte Gauchier, wife of the painter. A lady ſpinning. Jacques Gabriel Grillet, after Antreau. Charles Henri Friſo, prince of Orange. Dom Philippe, infant of Spain, after Vialy. Charles Porree, a Jeſuit, after Neibſon. Jean Juillienne, a celebrated amateur, holding the portrait of Watteau, after de Troy. The wife of the preceding, from the ſame. Charles Rollin, rector of the univerſity, after Coypel. Charles Coypel, at the age of forty-eight. Henri, count de Bruhl, firſt miniſter of the king of Poland, after Sylveſtre. This is a beautiful portrait, but the plate happening to be injured, has been re-touched. Auguſtus III. king of Poland, after Hyacinthe Rigaud, a whole-length figure accompanied by a little negro. This a chef-d'œuvre of engraving for boldneſs of execution; but the plate having received ſeveral ſubſequent alterations, the beſt proofs are become extremely ſcarce.

Jaques Aliamet was born at Abbeville A. D. 1727, and died at Paris in 1788. He firſt brought himſelf into notice by engraving ſmall ornamental prints for books, uſually termed vignettes; and his reputation was afterwards increaſed by the beautiful prints which he executed after Vernet. He alſo brought to perfection the method of working with the dry point, which he learned from his maſter Le Bas, and harmoniouſly united it with etching and the work of the graver. His ſtyle is peculiarly ſoft, and his touches juſt and expreſſive. He was an enemy to the ſhadows of prints being carried to blackneſs, and compared ſuch prints to thoſe actors, who, overſtepping the modeſty of nature, make the theatre reſound with their abſurd clamour and geſticulations, in order to gain the applauſe of the multitude.

The greater number of the prints of Aliamet conſiſt of landſcapes and ſea-pieces, with ſome few of a different kind.

The liſt of his beſt works follow: being all of the folio claſs.

A landſcape with various figures of men and animals. A pair, very capital and large, of "The Ancient Port of Genoa," and "Purchaſe of a Slave." "Grand Stag Hunt," a beautiful landſcape. "The Brick Kiln," "The Meeting of the Villagers." "The Rural Watering Place." "Village Pleaſures," all after Berghem.

After Wouvermans he engraved "The Spaniſh Halt," and the "Advanced Guard of Hulans." "Riſing of the Moon," after A. Vanderneer. The companion to this print is the moon overclouded, engraven by Zing. "View of Boom on the Rupel," after the ſame. "Two Views of Pont de l'Arche," after Ph. Hackert. A pair of Views of the "Engliſh Garden of Villette," after Jean Hackert, "Winter Amuſements," after Ad. Van de Velde. After Vernet he engraved ſeveral; the names of the chief are, "Stormy Weather." "Foggy Weather." "Italian Labourers." "Conflagration of a Port during the Night." Two views of the Levant. Two views of Marſeilles. A pair of ſea pieces, "Fiſhing with the Line," and "The Return from Fiſhing." And a ſet of the four parts of the day: "Morning," "Mid-day," "Evening," "Night." "The Birth of Venus," after Et. Jeurat. "The Place Maubert," after the ſame. "The Place des Halles," after the ſame. Two of the ſixteen great Chineſe battles were engraven by Aliamet, under the direction of Cochin.

Of the time and place of the birth of Jean George Wille, the preſent writer is not preciſely informed. He was a native of Germany, and eſtabliſhed himſelf at Paris as an engraver of the higheſt repute, about the middle of the laſt century, where, notwithſtanding the juſtly acquired fame of Mellan, Maſſon, Spierre, Nanteuil, Drevet and other ornaments of the French ſchool, he ſhewed that it was poſſible to tranſcend them all with reſpect to beauty and preciſion of manual execution. Strutt ſays of him, that "he

excelled

excelled in works which required great execution with the graver; and no one ever furpaffed him in the clearnefs and beauty of the ftrokes which he laid with that inftrument. His ftyle was particularly adapted to exprefs filks, fattins, and all kinds of fhining draperies; a proof of which is evident in the print reprefenting the death of Cleopatra; the figure of Cleopatra is habited in white fattin, which the engraver has fo fuccefsfully imitated, that the pencil of the moft able painter could not exceed it."

Not only fhining draperies, however, but rough and rich objects alfo, fuch as the carpets, tiffues, and dead game of Gerard Douw, and the woollen draperies and leather of Dietrichy, were equally within the fcope of his powers. His manual powers were indeed furprifing. The graver was a fimple and very ancient inftrument. Centuries had looked on, while thoufands of artifts had tried their fkill with it, yet it remained for the accurate eye, and firm, delicate, and fteady hand of Wille, to render it fubfervient to the expreffion of the textures of all the various fubftances that nature has produced, or art has interwoven.

From this general defcription of the perfections of the art of Wille, however, fome abatement fhould be made; at leaft certain exceptions; the concomitant errors of human nature fhould be pointed out to thofe who might elfe be in danger of having their tafte led away by indifcriminate admiration. The mathematical precifion of Wille was far better adapted to exprefs the polifh and regularity of art, than the wild and rugged furfaces in which nature more frequently delights; and even his flefh, which it muft neceffarily be of cardinal importance to exprefs well in every hiftorical work, when compared with that which is fo admirably characterized in the beft works of Bartolozzi and Strange, will appear deficient in that foft firmnefs, and delicacy of texture, which diftinguifhes it from all other furfaces whatever.

Wille was a member of the French Academy, and engraver to the king, honours which he richly deferved; he taught feveral pupils, of whom the prefent writer was informed by one, (the late Mr. Byrne, who ftudied under him for a while,) that he ufed, for moft purpofes, very fquare gravers, which is contrary to the opinion that is generally entertained. He died lately at Paris, having furvived the troubles of the French revolution, at a very advanced age.

To know his own talent, and to be furrounded by fuch circumftances of patronage and opportunity as enables him to ufe it moft effectually for the public advantage, does not often fall to the lot of an engraver. Wille enjoyed thefe benefits, and employed the greater part of his time in diffufing through Europe, along with his own, the fame of Gerard Douw, Dietrichy, Terbourg, Netfcher, Metzu, and fuch other mafters as are celebrated for the beauty of their execution, and the charms of their chiaro-fcuro.

Among his beft performances may be reckoned "The Death of Cleopatra," after G. Netfcher. A pair of uprights after Gerard Douw, entitled "La Menagerie Hollandoife," and "La Lifeufe." "The Good Friends," after Ad. Oftade. "Paternal Inftruction," and "The Dutch Gazette," from Terbourg. "La Cuifiniere Hollandoife," after Metzu, and "La Tricoteufe Hollandoife," after Fr. Mieris. "The Inattentive Obferver" is from the fame mafter. "The family Concert," and "The Little Mufician," are both after Schalken, and the above are all of the folio clafs. Of a larger folio fize, are "Sarah introducing Hagar to Abraham," after Dietrichy. And from the fame painter, "The Strolling Muficians," and "The Reciprocal Offer," a pair, the former of which is the moft celebrated; it is dedicated to Frederic Auguftus, elector of Saxony, and the firft impreffions are known from thofe fubfequently taken, by the word "Electorale" being omitted in the dedication.

"Maternal Care," "Maternal Delight," and "The School Miftrefs," are from the pictures of the junior Wille; and "The Little Scholar," companion to the latter, from J. E. Schenau. Thefe alfo are in folio.

From the younger Wille, he has alfo engraven a large plate, entitled "Le Maréchal des Logis," which reprefents the courage of Louis Gillet in refcuing a young girl from the power of two robbers; and one of his celebrated, though by no means the beft of his hiftorical engravings, is "The Death of Mark Antony," after Pompeo Battoni.

Wille's portrait was engraven after a picture by his fon, by his pupil P. C. Ingouf, and in his own ftyle. The portraits from his own graver are numerous, and among the beft are reckoned thofe of Madeleine de Scuderie, and Nicholas de Catinat, marfhal of France, both efteemed chef-d'œuvres of the mafter, and after Eliz. Cheron, in 8vo. Henry Benvift, a rare print in quarto. Francifcus Chicogneau, regi a fanctioribus Confiliis archiatrorum Comes, after Le Sueur. Bernard Belidor, after Vizé, engraven in 1754. Profper Cardinalis Columna de Sciarra, after P. Battoni. All in quarto.

The following are all of the folio clafs: C. E. Brifeux, architect, from the life. Marguerite Eliz. de Largilliere, from a picture by her father. Eliz. de Gouy, daughter of H. Rigaud, from a picture by her father. Jofeph Parrocel. Jean de Boullogne, comptroller-general of finance. Charles Louis Auguftus Fouquet de Belleifle, and Maurice of Saxony, marfhal of France, all after Jof. Parrocel. Woldemar de Loevendal, marfhal of France, after de la Tour. J. B. Le Moine, after J. G. Heilmann. Frederic II. king of Pruffia, after Pefne, a celebrated print. Hieronymus von Erlach, after Rufca. Francifcus Quefnay, after J. Chevalier. Jean Battifte Maffé, after Tocque. Louis Philippeaux, comte de St. Florentine, fecretary of ftate, &c. &c. is efteemed one of his beft portraits, and Abel François Poiffon, marquis de Marigny, after Tocque, was engraved for his reception into the French Academy.

We have now brought down our account of the French School of Engraving to a period, beyond which, if we were to proceed, we muft fpeak of the merits and demerits of living artifts. The critics and literati of France have with reafon regretted the decline of French engraving, fince the era when all Europe was gazing at the conftellation of art which fhed luftre over the reign of their fourteenth Louis. A few bright but fcattered rays in Wille and his difciples have gleamed over the metropolis, but a diftinguifhed member of the National Inftitute has within thefe few years acknowledged and lamented that England had borne away the palm of engraving; that the era of French glory in this art was no more; that the indifference of the ancient government towards the art, the want of encouragement and patriotifm, without which the grandeft conceptions are unavailable; the abfence of emulation, the neceffity of gaining a livelihood, which renders the ingenious artift a flave to the caprices or cupidity of the dealer; luxury itfelf which corrupts tafte, and the falfe fplendour which leaves fimplicity and beauty in the fhade, have all concurred, he fays, to reduce the art of engraving to its prefent woeful ftate. Along with this plaint, a plan for renovating the art was fubmitted to the Directory by Monf. Guyton, which we believe has never been attempted to be put in execution. Other and more efficient plans will doubtlefs fucceed the prefent war,

if they be not organizing even now, of which let England liberally beware; for among the men of talent whom the revolution has fpared, Berthaud, Bervic, Denon, and perhaps others of whom future Cyclopedias fhall fpeak, remain to their country.

French *Silk*. See Silk.

French *Town*, in *Geography*, a town of America, in Cecil county, Maryland, on the E. fide of Elk river; 1 mile S. of Elkron, from which it is feparated by Elk creek. Elk ferry is 6 miles below this.

French *Verfions of the Bible*. See Bible.

French *Weights*. See Weights.

FRENCHMAN. See Francigena and Englecery.

Frenchman's *Bay*, in *Geography*, a bay of America, which lies on the fea-coaft of Lincoln county, in the ftate of Maine, and is formed by Mount Defert ifland on the weft, and the principal of Goldfborough townfhip in the eaft. It has an inland communication round Defert bay with Blue-hill bay.—Alfo, a bay on the S. coaft of the ifland of Jamaica between Great Pedro bay and Starvegut bay.

Frenchman's *Creek*, a creek of Upper Canada, in the county of Lincoln, which difcharges itfelf into the river Niagara, in the townfhip of Bertie, a few miles below Fort Erie.

Frenchman's *Key*, a fmall ifland on the Spanifh Main. N. lat. 12° 16'. W. long. 82° 51'.

FRENEASE, Lake, a large collection of water, through which St. John's river in New Brunfwick paffes.

FRENICLE de Bessy, Bernard, in *Biography*, a mathematician, the intimate friend of Des Cartes, Fermat, and other learned men his contemporaries, flourifhed in Paris in the 17th century. He was an expert mathematician, and was chofen member of the French academy of fciences in 1666. The memoirs of that learned body he furnifhed with a number of fcientific pieces. Among thefe is one entitled "A method of refolving problems by exclufions:" and alfo "A treatife of right-angled triangles in numbers:" "A fhort treatife on combinations:" "Tables of magic fquares." In the well known work, entitled "Commercium Epiftolicum de Quæftionibus quibufdam Mathematicis," printed at Oxford in 1658, the reader will find fome of Frenicle's letters. He died in 1695. Moreri.

FRENTANA Regio, in *Ancient Geography*, Hither Abruzzo, a country of Italy, bounded by the Tifconus on one fide, and by the Aternus on the other.

FRENTANI, a people of Italy, N.E. of Samnium, along the Adriatic gulf; their principal towns were Auxinum and Larinum.

FRENUM, or Frænum. See Frænum.

FRENZANO, in *Geography*, a town of Italy, in the department of the Mela; 8 miles W.S.W. of Brefcia.

FRENZY, and Frenetic. See Phrenzy, and Phrenetic.

FRERE, Cape, in *Geography*, a cape on the E. coaft of the ifland of Martinico.

FREREN, or Vreren, a town of Germany, in the county of Lingen; 6 miles S. E. of Lingen.

FRERET, Nicholas, in *Biography*, was born at Paris in 1668; he was educated for the profeffion of the law, and in compliance with the wifhes of his friends, he entered upon the duties of an advocate, but without intending to devote his talents to the bufinefs. His favourite ftudies were hiftory and chronology, which he purfued with fo much ardour and fuccefs, that he obtained admiffion into the Academy of Infcriptions at the early age of twenty-five, and immediately fignalized himfelf by a "Difcourfe on the origin of the French." This difcourfe was too bold for the times in which he lived, and in conjunction with fome imprudent language on the mifunderftanding between the princes of the blood and the regent, caufed him to be imprifoned in the Baftile. During his confinement he was a conftant reader of Bayle, imbibed all his fceptical principles, and almoft committed his works to memory. After his liberation he publifhed feveral pieces, which exhibited profound learning, and much curious difcuffion. He wrote with perfpicuity and order; his "Letters from Thrafybulus to Leucippus," and the "Examination of the Apologifts of Chriftianity," are deeply tinged with fceptical tenets. Many of his pieces were of a lighter defcription, as the preface, notes, and part of a tranflation of the Spanifh Romance entitled "Tirante the White." He died in 1749.

FRERON, Elie Catherine, was born at Quimper in 1719. He entered very young among the Jefuits, with whom his literary tafte was formed, but in 1739 he quitted them, and became a coadjutor of the abbé Fontaines in his periodical publications. (See Fontaines.) He then publifhed a fmall critical journal of his own under the title of "Lettres de Mad. la Compteffe," 1746, in which he treated with freedom the literary reputation of fome contemporary authors who had fufficient influence to procure the fuppreffion of his work. It re-appeared in a few years under a different title, *viz.* "Lettres fur quelques Ecrits de ce Tems," and was well received and liberally fupported. Thirteen volumes being publifhed, it was dropped, and a new one began, entitled "L'Année Litteraire," which he continued till his death. Freron had the misfortune of uniting againft him fome of the principal writers of the day, among whom was Voltaire. Freron had long carried on a warfare againft this popular author without provoking his difpleafure. A fevere criticifm upon his comedy of "La Femme qui a Raifon," excited the wrath of the dramatift, and never after this did he omit an opportunity of throwing odium and contempt on Freron and his works. He was willing however to do homage to his talents and to his tafte as a writer. He died in 1776. Befides his periodical works he publifhed "Opufcules," in three volumes 12mo. confifting of pieces in profe and verfe. He wrote likewife, "Les vraies Plaifirs, ou les Amours de Venus et Adonis," tranflated from the Italian. He began a tranflation of Lucretius. Freron was pleafant and eafy in his manners, fond of fociety, and given to diffipation.

FRESCA, Cape del, in *Geography*, a cape on the W. coaft of Solfara. N. lat. 39° 45'. E. long. 8° 28'.

FRESCATI. See Frascati.

FRESCO Painting is a peculiar mode of practice in that art, and is performed by employing colours mixed and ground with water upon a ftucco, or plafter, fufficiently frefh and wet to imbibe and embody the colours with itfelf. The term frefco, as applied to painting, is faid to have been adopted becaufe the practice of it is ufed in the open air; "Andare al Frefco," fignifying "to take the air," or "walk abroad in the air:" but it feems more probable that another meaning of the word frefco has given rife to this particular adoption of it, *viz.* new or frefh, relative to the ftate of the plafter in which it is wrought. Vitruvius (l. vii. cap. 4.) calls it "Udo tectorio." It is very ancient, having been practifed in the earlieft ages of Greece and Rome.

The theory of the art of painting extends its principles to all modes of execution, becaufe theoretic rules are drawn from nature, which is the object of all imitation, and are independent of the means employed in producing the intended

intended effect. We shall therefore only treat in this place of the mode of execution, and materials adopted in fresco paintings.

Previously to their being executed in any place, a careful examination should be made of its fitness to receive them. It is necessary that the artist should be assured of the perfect construction of the walls, or cielings, on which he intends to employ his genius, and intrust his reputation; above all, he must be careful to make it secure from damp.

Satisfied with the construction of the wall, it is then necessary the artist should see to the proper management of the first layer of plaster with which it is covered. The materials employed for building in different countries will vary according to the nature of those most easy to be obtained: of course, it will be necessary to adopt means for rendering those not perfectly proper in themselves to receive fresco painting, more so by artificial means. The one best calculated to hold the plaster perfectly is brick; both on account of its absorbing quality, and from the smallness of the size of the bricks causing a number of interstices between them; which irregularity in the surface greatly assists in retaining it in adherence. A wall built of rough stones full of holes may also be relied upon as a good foundation for fresco; but if, instead of that, it be constructed of smooth or polished stones, it will then be necessary to render it uneven by making holes in it, fastening nails, and small wedges of wood which will hold the plaster together, and prevent its falling off. These precautions are of the utmost consequence to prevent the danger of its bending or cracking, which the least alteration that happens to the materials, or even the change of weather, producing alternately wet or dry, may occasion.

The first layer of plaster may be composed of well-washed chalk made into a cement with pounded brick, or river sand; which last is better, being rather the coarsest, and producing thereby a roughness of surface which will better retain the second coat.

Perhaps the tarras now in use, which is composed of pounded sea sand and chalk or lime, would be better still. The ancients had certainly a better compost for this purpose than is at present known; witness that which still covers various of their buildings; particularly the aqueduct they constructed near Naples, and the walls of the ruins of Herculaneum.

Before the second layer is given, it is proper to wait till the first be perfectly dry, on account of a disagreeable and noxious vapour which issues from the lime in drying; but where it is so, and you proceed to give it the second coating upon which the painting is done, it must be wetted with water, that the two may more completely incorporate. This layer, which requires to be more carefully prepared than the first, is made by mixing river sand of an even and fine grain with chalk, which has been burnt a twelvemonth before, and exposed to the air, as by that means the artist may be more sure of its general decomposition and freedom from stony parts.

It requires considerable skill in the person who prepares this ground to lay it perfectly even, and be careful in judging the quantity proper to be laid on at once, which ought not to be more than the painter can cover and completely finish in a day; and it requires great skill and activity to spread, to clean it from lumps, and to polish it evenly, so as to receive the painting with the promptitude requisite to leave the artist as much time as possible, or as he may have occasion for. The painter however should himself superintend this part of the process, for he alone can judge properly as to the rapidity with which he can labour, or the advantages he may make of accidental occurrences.

The operation of laying on the ground is performed with a trowel; and in doing it, care must be taken to clean it properly, that the surface may be even, particularly in those parts most exposed to view. The conclusion of the mason's labour is polishing to receive the painting. This is done by applying a piece of paper on the surface, and passing the trowel over it; it is very necessary that this should be well done, for small inequalities in the surface might, in certain views, produce great irregularities in the drawing of the work.

When the second ground is thus prepared, cleaned, and polished, in the quantity, and on the part of the wall which the artist requires, he begins to trace his design upon it, and proceeds to the colouring of it; completely covering the quantity prepared, and finishing so much of the picture in the course of the day, in such a manner that he may not have occasion to re-touch it when the ground is dry. This peculiarity is the characteristic distinction of painting in fresco, which, by this mode of operation, is incorporated with the mortar, and drying along with it, becomes extremely durable, and brightens in its tones and colour as it dries.

From the necessity there is in the progress of this style of art, that it should be executed with rapidity, and from the impossibility of retouching it without injuring the purity of the work; the artist, unless he be endowed with very extraordinary powers of imagination and execution indeed, is obliged to prepare a finished sketch of the subject, wrought to its proper hue and tone of colour, and so well digested, that there may be no necessity for making any essential alterations in the design. This, which is a very useful mode of proceeding in all historic works of painting, is absolutely indispensible in fresco, to those who are not determined to give the rein to their ideas, and leave as perfect whatever may first present itself. There is no beginning in this, by drawing in the whole of the parts at one time, and correcting them at leisure, as is the custom with oil painters, who may therefore proceed to work without a sketch; here all that is begun in the morning must be completed by the evening; and that almost without cessation of labour, while the plaster is wet; and not only completed in form, but also, a difficult, nay almost impossible task, without a well prepared sketch, must be performed, *viz.* the part done in this short time must have so perfect an accordance with what follows, or has preceded of the work, that when the whole is finished, it may appear as if it had been executed at once, or in the usual mode, with sufficient time to harmonize the various forms and tones of colour. Instead of proceeding by slow degrees to illuminate the objects, and increase the vividness of the colours, in a manner somewhat similar to the progress of nature in the rising day, till at last it shines with all its intended effect, which is the course of painting in oil; the artist working in fresco must at once rush into broad daylight, at once give all the force in light and shade and colour, which the nature of his subject requires, and this without the assistance (at least in the commencement) of contrast to regulate his eye; so that here, as has been said, a well digested and finished sketch seems indispensibly requisite.

The sketch being completed, the next process is to prepare a cartoon or drawing of the design on paper pasted together to the size of the intended fresco. This cartoon should be perfected in the out-line to save time, and the artist has then nothing to do but to trace the line of the figures or other objects which the design may be composed of, on to the plaster, by either pricking with a pin through the paper, or by passing a hard point over the lines of the

 cartoon.

cartoon. By this means he faves himfelf the trouble of drawing the figures, and alfo the time which would be required for doing it, and proceeds at once to the painting, to facilitate the execution and enfure the fuccefs of which feveral precautions are requifite.

The colours being ground fine in water, and the teints moft likely to be employed largely compofed, they fhould be arranged in pots or bafons, and feveral pallettes with raifed edges fhould be ready at hand to work from, and affift in compounding the varieties of hues neceffary for producing brilliancy and harmony. A few pieces of tile or brick, or of any abforbent ftone, fhould alfo be provided to prove the teints upon, becaufe all colours ground in water become much lighter when dry, than they appear when wet. To be certain therefore of their hue, before he begins to ufe them on the picture, and to avoid the trouble and neceffity of much changing or labouring them, (as the painters term the blending of colours,) the artift fhould apply fome of each teint with his brufh to the dry brick, &c. which, abforbing the water, the colours immediately appear very nearly of the fame hue they will be of when the frefco is dry. Hence he may proceed with great fecurity in his work, and is fure to have it much more frefh and vigorous in effect, than it would be if much labour had been employed to obtain the tone on the wall.

It will be requifite alfo to have at hand a vafe or bafon of water, or a wet fponge, and to take care not to begin to paint till the layer of mortar is hard enough to refift the impreffion of the finger: otherwife the colours would fpread upon it, and prevent all poffibility of neatnefs or clearnefs in the execution, which fhould be effected with great rapidity and lightnefs of hand.

With refpect to the colours employed *in frefco*, they are fewer in number than thofe which may be ufed in oil painting, on account of the combined action of the lime, and the air upon the component parts of many of the latter. Thofe moft generally in ufe are the following, *viz.*

Lime White.—This, when made of well wafhed burnt chalk or lime, is the beft and moft fimple white that can be ufed; it mixes freely with all the other colours, and works in itfelf with a full body. The preparation of it requires, that the chalk fhould be flacked a twelvemonth before it is ufed, or at leaft fix months. It fhould then be diffolved in common water and poured carefully off, (after letting it fall fome fhort time,) into a veffel to fettle.

Another white is made by mixing one third of white marble powder with two thirds of chalk; but it muft be ufed with caution, as it is apt to change. If the proportion of marble duft be too ftrong for the chalk, it will become black. The artift would therefore do well to confine himfelf to chalk white, provided it has been well prepared and kept a long time. As this however has frequently been ufed, we deemed it proper to be mentioned that artifts may, if they choofe, make experiments upon its nature, and endeavour, if they find any peculiarly valuable quality in it, to infure its continuance in clearnefs and perfection.

Egg-fhell White.—There is alfo a third white made of egg-fhells, which, though it has not the full texture of the chalk, is yet very clear and good for ufe in frefco. It is made by boiling egg-fhells in water with a little quick lime. They are then put into a pot and wafhed with pure water, then pounded fine, wafhed again till no teint is given to the water, and then ground by the muller and ftone to the degree fit for ufe; it is afterwards formed into little cakes which are dried in the fun. Care muft be taken not to let the powder of the fhells remain too long in the fame water, as it will exhale a fœtid vapour almoft infupportable, which cannot be diffipated but by roafting it in a clofe veffel well luted.

Red—produced by burnt vitriol, in colour approaching to Indian red, and ground in fpirits of wine, acts well with the lime, refifts the action of the air, and mixes cleanly with the other colours. This forms an excellent preparation to receive the bright red of cinnabar or vermilion, when the whole wall is covered.

Colours of earthy textures, fuch as the ochres, when burnt or not burnt, umber, both raw and burnt, Spanifh red, verd de Verona, Venice black, and blue black, made by bruifing vine ftalks, or fhells of peach-nuts, are all excellent for the purpofes of frefco painting.

Of Blues,—the beft is the ultramarine, as it never fuffers any change. Smalt or enamel blue is good as to preferving its tone, and, if ufed early in the work, will adhere; but if the ground fhould become too dry before it is ufed, it is apt not to incorporate ftrongly with it, but to come off on the leaft friction.

White lead, lake, verdigreafe, mafticott, Naples yellow, the orpiments and bone black, are all unfit for this purpofe, being liable to change.

This kind of painting, when carefully executed, is of all others the moft durable, and therefore the moft proper to be employed in adorning public buildings. The ufe of it for this purpofe appears to be very ancient. Norden fpeaks of paintings in Egyptian palaces 80 feet high, which Winkelman quoting, concludes they were in frefco, from the defcription given of the prepared grounds, and of the manner in which the colours appear to have been ufed. And all the paintings found at Herculaneum, at Portici, and at Rome, of ancient date, are of the fame materials. No other kind of painting would fo effectually have refifted the action of the air for fo great a length of time, and more particularly the exceffive aridity thofe of Herculaneum muft have endured, being fhut up entirely from the light, and amidft glowing embers from Vefuvius, which of courfe muft at firft have caufed an intenfe heat around them. That however, in one point of view, was favourable to the prefervation of thofe that efcaped its immediate action; for damp is the moft powerful deftroyer of them, againft which no caution taken can make them too fecure. In this cafe of Herculaneum, it muft have been effectually excluded, firft by the heat of the afhes, and afterwards as the ftratum of thofe afhes was fo thick, water from above could not penetrate fo low as to the pictures, particularly after the upper part was covered with the clofe cake formed by the decompofed parts on and near the furface.

In ordinary fituations, the choice of materials is the moft important part; that the durability of the work may be fecured, particularly the preparation of the ground, and of the wall, to caufe it to adhere.

Frefco painting is, or rather has been, chiefly employed in palaces, temples, and other public edifices. For large and important places no other kind of painting is fo good. As the artift is obliged, from its nature, to proceed with rapidity in its production, it has neceffarily more fpirit and vigour in the execution, than paintings in oil, which may be repeated, and re-touched, as often as the artift fancies he can improve, or heighten, their effect. In frefco there is not time to meddle and difturb the frefhnefs of the colour, or the fullnefs and freedom of the touch. But there can be no minute detail of forms, or extenfive variety, in the gradation of teints; the beauties of neatnefs, and delicacy of finifhing, make no part of the excellencies of this branch of the art; it will not bear the clofe examination which well finifhed pictures in oil do; there is fomething dry and rough

in

in its appearance, unpleafing to the common obferver, on too clofe an infpection. It lacks the full rich fweetnefs of hue and texture which oil paintings poffefs; and though it has more frefhnefs, and retains it; yet from the confined number of colours which can be employed in it, it is not equal to oil in the perfection of the imitation of nature.

Whoever feeks to be pleafed with frefco painting, muft learn juftly to eftimate the beft, and not the moft agreeable qualities of the art. Character, contour, expreffion, are within its powers; and are the points which the great artifts who practife it, knowing its limits, will endeavour moft to exhibit in their productions. Harmony of colouring, chiaro-fcuro, and the minute graces of execution, have never yet been rendered in it; or but very partially in comparifon with works in oil.

In the early part of the reftoration of painting, a fpecies of frefco was the only mode of practifing the art in ufe. A ground of chalk was prepared on tablets of wood, and the colours laid on it, ground and mixed in water only, or with fome gluten foluble in it. The furface of the picture was afterwards covered with a varnifh, to fecure it from rubbing, and to give the teints more force and luftre.

The principal works that have been produced in frefco, are the feries of biblical and evangelical hiftoric pictures which adorn the walls and cieling of the chapel of Sixtus V. at Rome, by M. A. Buonarotti. The chambers of the Vatican, known by the name of the Stanze of Raphael; which confift principally of religious hiftories, interfperfed with fome legendary tales relative to the popes; and the cupola of the duomo of Parma, or church of St. Giovanni in that city, by A. Corregio. It reprefents the afcenfion of the Virgin amidft a choir of angels, and with a number of figures of faints below regarding it. One beautiful and grand work, by Daniel Ricciarelli, commonly called Da Votterrà, at the altar of the church of Trinita da Monte, the fubject of which is taking Chrift down from the crofs, is faid to have been deftroyed by the French, in their endeavours to move it to France. They had fucceeded in feparating it from the wall on a perpendicular fcaffold; but in doing it, they fo weakened the wall, that in the night the roof fell in upon the picture, and broke it to pieces. Such at leaft is the report of its fate, which in the prefent unfettled ftate of the continent, there are no means of decidedly afcertaining the exact truth of. Dorigny has engraved a large print of the defign: and the picture has been thought fo well worthy of attention, that an infinite multitude of copies have been made of it, either for improvement, amufement, or profit.

Painting in frefco is not much practifed now. The want of experience neceffarily produces a want of fkill. None but thofe poffeffed of large fortunes can be expected to call for it, and without being fpecially employed in it, no artift can be expected to practife it. The ufe of it would perhaps not be fo fecure here as in Italy, as the feverity of froft, and the dampnefs of the air, might prove injurious to its exiftence.

Vafari, however, gives the moft powerful reafon for its difufe: he fays, "many of our painters excel in oil and water colours, and yet fail in frefco; becaufe, of all kinds of painting, this requires the greateft ftrength of genius to execute; great refolution and great knowledge to give every ftroke its juft character, and to employ them with expreffion and propriety." If in the period wherein he lived, and he died not till 1578; if in that period, when fo many great men of fuperlative genius flourifhed in the art of painting, few could be found either fkilful or hardy enough to undertake works in frefco, we cannot be furprized that it is not now practifed largely, when the tafte of the time, delighting in prettineffes and trifles, does not call for fuch reprefentations of fublime conceptions, nor the grandeur of ftyle in art fought for and practifed when Vafari wrote. See Watelet, Vafari, Encyclopedie François, Vitruvius.

FRESCOBALDI, Girolamo, in *Biography*, the greateft performer on the organ and harpfichord, and the beft compofer for thofe inftruments that Italy could boaft during the feventeenth century, was a native of Ferrara, but went early in his life to Rome with his mafter Milleville, where he was elected organift of St. Peter's church. All the mufical writers of Italy have celebrated his talents; and his works, which ftill remain, are indifputable vouchers of the truth of their encomiums. Quadrio fays, that early in his youth, as a finger, he delighted every ear, and was praifed by every tongue in the principal cities of Italy. But his chief excellence confifted in compofing and playing on the organ and harpfichord, for which he became fo renowned, that his works, both printed and manufcript, were in the hands of all profeffors and collectors of mufical compofitions. The emperor Ferdinand III. fent Froberger, a young German of promifing genius, to Rome, on purpofe to receive inftructions from Frefcobaldi; by which he profited fo well, that he was appointed imperial organift on his return. According to Della Valle, Frefcobaldi was living in 1641. His firft work, entitled "Ricercari e Canzoni Francefe, fatte fopra diverfi oblighi in Partitura, libro primo, 1615," contains the firft compofitions we have feen printed in fcore, and with bars. They are likewife the firft regular fugues that we have found upon one fubject, or of two fubjects carried on at the fame time, from the beginning of a movement to the end. Ricercari and fantafie preceded fonatas and concertos, and were the firft compofitions exprefsly made for inftruments, after the invention of counterpoint. The fugues of Frefcobaldi have great merit, if we confider the ftate of inftrumental mufic at the time they were produced: the fubjects are marked, the harmony pure, and the ftyle chafte and clear. Frefcobaldi's mafterly and pleafing fugues added new dignity and attractions to the organ; they were foon imitated all over Europe, and wherever there was an organ and an organift poffeffed of hand and head capable of emulating a ftyle fo fuitable to the genius of that inftrument. It is not faid in the title page for what inftruments the feveral parts were defigned; but as the author was a great organ player, we make no doubt but that they were firft produced by and for that inftrument, as all the four parts are fo compact and clofely connected, that they are ftill within the grafp of the two hands. Notwithftanding many of thefe fugues are upon two, three, and even four fubjects, and every learned artifice of inverfion, augmentation, diminution, and moto contrario, is ufed, he has had the dexterity to avoid confufion. But as he is faid to have produced many motets and maffes for the church, the fimplicity of the fubjects of the fugues of his ricercari and canzoni were probably thofe of his vocal fugues. The "Sonate d'intavolatura di cimbalo ed organo partite di diverfe arie e corrente, Ballati, Ciaccone, Paffacagli di Frefcobaldi," publifhed at Rome in 1637, upon fix lines for the right hand, and eight for the left, are very full, and of difficult execution. Thefe pieces being embellifhed with the fafhionable divifions and graces of the times, have fuffered more by age than the ricercari, which have all the fimplicity of vocal fugues in the church ftyle. But even in his toccate and variations on old airs, we find more tafte and paffages which have ftood their ground, than in any other harpfichord mufic of the fame period.

Our

Our Bird, Dr. Bull, and Giles Fornaby feem to have been the greateft organ players in Europe during the fixteenth century, and the beginning of the next, till Frefcobaldi introduced a fuperior ftyle of treating the organ, diverted of rapid and frivolous divifions which difgrace that moft noble and comprehenfive of all inftruments. Indeed the fugues in the ricercari of Frefcobaldi are worked with fuch genius and learning as have never been furpaffed, unlefs by thofe of Sebaftian Bach, and Handel, which feem to include every perfection of which this ingenious and elaborate fpecies of compofition is capable. Indeed, if we except thefe fugues, all inftrumental mufic, particularly that for keyed inftruments, feems to have been in a very rude ftate at this time throughout Europe. It was dry, difficult, unaccented and infipid.

FRESH denotes the rife of water in a river, or a fmall flood. See Freshes.

Fresh-*doors*, a fort of fluices to let go water, fo that it may run in frefhes, or in flufhes.

Fresh *Diffeifin*, in *Law*, (*frifca diffeifina*, from the French *frais*, i. e. *recens & diffeifir*, viz. *poffeffione ejicere*,) fignifies that diffeifin which a man might formerly feek to defeat of himfelf and by his own power, without reforting to the king or the law; as where it was not above fifteen days old, or fome other fhort continuance. Britton cap. 5. Of this Bracton writes at large, concluding it to be arbitrary. Lib. iv. cap. 5. See Disseisin.

Fresh *Fine*, is that which was levied within a year paft. Weftm. 2. 13 Ed. I. ft. 2. cap. 45. See Fine.

Fresh *Force*, *frifca fortia*, denotes a force done within forty days.

If a man be diffeifed of lands or tenements within any city or borough; or deforced from them after the death of his anceftors, to whom he is heir; or after the death of his tenant for life, or in tail, in dower, &c. he may, within forty days after his title accrued, have his remedy by an affize, or bill of frefh force. This affize or bill is fued out without any writ from the chancery; but after the forty days, there is to be a writ out of chancery, directed to the mayor, &c. But this writ is obfolete fince ejectments have come in ufe for recovering the poffeffion of lands, &c.

Fresh *the Hawfe*, on board a *Ship*. See Hawse.

Fresh *Shot*, in the *Sea-phrafe*, fignifies the falling down of any great river into the fea; by means whereof the fea hath frefh water a good way from the mouth of the river. As this is more or lefs, they call it a great, or fmall frefh fhot.

Fresh *Spell*, in the *Sea Language*, a frefh gang, to relieve the rowers in the long boat.

Fresh *Suit*, *recens infecutio*, in *Law*, is fuch a prefent and active profecution of an offender, where a robbery is committed, as never ceafes from the time of the offence committed, or difcovered, till he be apprehended.

The benefit of fuch purfuit of a felon is, that the party purfuing fhall have his goods reftored to him; whereas otherwife they are forfeited to the king. When an offender is thus apprehended and indicted, upon which he is convicted, the party robbed fhall have reftitution of his goods; and though the party robbed doth not apprehend the thief immediately, but fome time after the robbery, provided he ufed his utmoft endeavours to take him; or though he happens to be apprehended by fome other perfon, yet it fhall be adjudged frefh purfuit. Terms de Ley. See Waifs.

Where a gaoler immediately purfues a felon, or other prifoner efcaping from prifon, it is "frefh fuit," to excufe the gaoler; and if a lord follow his diftrefs into another's ground, on its being driven off the premifes, this is called "frefh fuit:" fo where a tenant purfues his cattle that efcape or ftray into another man's lands, &c.

Frefh fuit is either within the view, or without. Manwood fays, that upon frefh fuit within the view, trefpaffers in the foreft may be attached by the officers purfuing them, though without the limits of the foreft.

It has been faid that frefh fuit may continue for feven years. See Hue *and Cry*.

Fresh *Water*, is that not tinctured or impregnated with falt, or faline particles, enough to be difcoverable by the fenfe.

Such generally is that of fprings, rains, wells, lakes, &c. Dr. Lifter is of opinion, that the natural and original ftate of water is to be falt: the frefhnefs he fuppofes to be accidental, and to be owing to the vapours of plants, and the breath of animals therein; and to the exhalations raifed by the fun.

Others will have all water originally frefh, and take its faltnefs to be accidental; to account for which, a great number of hypothefes have been framed.

The faltnefs of water is a foreign, and in moft cafes a hurtful quality. It renders it not only naufeous to the tafte, but greatly prejudicial to the body; and it is generally agreed that thofe waters, *cæteris paribus*, are beft, not only for drinking, but alfo for economical ufes, as wafhing, boiling, and brewing, which are the freeft from faltnefs.

Hence, various methods have been contrived for examining the frefhnefs of waters, and for dulcifying or making falt water frefh.

Mr. Boyle gives us a method of examining the frefhnefs of water, by means of a precipitate, which cafts down any faline particles before floating therein.

Into one thoufand grains of diftilled water he puts one grain of falt; and into the folution lets fall a few drops of a ftrong well filtrated folution of a well refined filver, diffolved in clear aquafortis; upon which there immediately appears a whitifh cloud, which, though but flowly, defcends to the bottom, and there fettles in a white precipitate, in which is the faline matter of the fluid.

This method, if it were required, would examine water to a greater nicety than that here fpecified. It has difcovered falt in water where there was but one grain of falt in two thoufand, nay in three thoufand times the weight of water.

The experiment was tried before the Royal Society in 1692, by fir Hans Sloane; where it was likewife found that a drop or two, even of fpirit of falt, mixed with common water, would be difcovered by the fame method. Phil. Tranf. Abr. vol. ii. p. 298.

Dr. Hook, in the fame year, read a lecture before the Royal Society, on a method of his own, for difcovering the fmalleft quantity of falt contained in water, on a principle of hydroftatics. The operation was performed by means of a large poife of glafs, of the fhape of a bolt-head; the ball thereof was three inches in diameter, and the neck $\frac{1}{7}$th of an inch. This being fo poifed, with red lead put in it, as to make it very little heavier than frefh water; and then fufpended by the fmall ftem which was graduated, to the end of a nice beam of a balance; and the degree or divifion of the neck, contiguous to the furface of the water, noted; upon infufing a quantity of falt, only equal to the two thoufandth part of the weight of the waters, the neck of the poife funk near half an inch

inch lower in the water. Phil. Tranf. Abr. vol. ii. p. 304.

The dulcifying, or making of falt water frefh, is a fecret that has been long fought with great attention. For an account of the principal attempts that have been made with this view, fee *Sea*-WATER.

FRESH *Wind*, fignifies ftrong, but not violent; hence when the gale increafes, it is faid to frefhen.

FRESHES, in *Sea language*, denote the impetuofity of an ebb-tide, increafed by heavy rains, and flowing out into the fea, often difcolouring it to a confiderable diftance, and forming a line that feparates the two colours, and which may be diftinctly perceived for a great length along the coaft.

FRESHFORD, in *Geography*, a fmall poft-town of the county of Kilkenny, Ireland, which is 7 miles from Kilkenny on the road to Urlingford, and 64½ miles S.W. from Dublin.

FRESHWATER BAY, a bay in the ftraits of Magellan. N. lat. 53° 27'. W. long. 72° 13'.—Alfo, a bay on the S.W. coaft of the Ifle of Wight. N. lat. 50° 37'. W. long. 1° 31'.—Alfo, a bay on the E. coaft of Newfoundland. N. lat. 49° 10'. W. long. 53° 30'.

FRESHWATER *Ifland*, a fmall ifland in the Atlantic, near the coaft of South Carolina. N. lat. 33° 5'. W. long. 79° 15'.

FRESHWATER *Key*, a fmall ifland in the Spanifh Main, near the Mofquito fhore. N. lat. 14° 23'. W. long. 82° 25'.

FRESNAY, a town of France, in the department of the Sarthe, and chief place of a canton in the diftrict of Mamers; 18 miles N. of Le Mans. The place contains 1921, and the canton 13,810 inhabitants, on a territory of 207½ kiliometres, in 12 communes. N. lat. 48° 17'. E. long. 0° 6'.

FRESNAYE, LA, a town of France, in the department of the Sarthe, and chief place of a canton in the diftrict of Mamers, 6 miles E. of Alençon. The place contains 1,555, and the canton 6,875 inhabitants, on a territory of 145 kiliometres, in 14 communes.

FRESNE-EN-WŒVRE, a town of France, in the department of the Meufe, and chief place of a canton in the diftrict of Verdun, 10 miles S.E. of Verdun. The place contains 823, and the canton 12,715 inhabitants, on a territory of 257½ kiliometres, in 38 communes.

FRESNE-ET SAINT-MAMEZ, a town of France, in the department of the Upper Saône, and chief place of a canton in the diftrict of Gray, 12 miles N.E. of Gray. The place contains 558, and the canton 9,311 inhabitants, on a territory of 200 kiliometres, in 23 communes.

FRESNEDA, LA, a town of Spain, in the province of Arragon, once ftrongly fortified, but burned and difmantled in the year 1706 by the troops of Philip V.; 12 miles S.S.E. of Alcaniz.

FRESNILLO, a town of Mexico, in the province of Zacatecas; 40 miles N. of Zacatecas.

FRESNO, a town of Spain, in Old Caftile; 5 miles S. of Borgo d'Ofma.—Alfo, a town of Spain, in Andalufia, 20 miles N. of Cordova.

FRESNOY, CHARLES ALPHONSE DU, in *Biography*, a poet and a painter, defervedly regarded with more eftimation in the former than the latter character; although painting was the object of his moft anxious defires and labours, and poetry but the amufement of his leifure hours.

He was born in Paris in the year 1611, and deftined by his father, who was an apothecary, to the profeffion of phyfic. He therefore received a good education, and early in life evinced a tafte for poetry, and carried away all the prizes in it which were propofed in the college where he was educated, to excite the emulation of his fellow ftudents. His inclination for it increafed with exercife, and the pleafure he took in that, and its fifter art of painting, which poffeffed equal power over him, diverted him fo much from the ftudies requifite for the practice of the profeffion he was intended for, that he at laft, notwithftanding the oppofition and remonftrances of his parents, gave over the purfuit of it, declaring himfelf decidedly for painting; which he took every opportunity of cultivating with great affiduity.

At the age of nineteen or twenty he began to learn defign under F. Perier; after two years fpent with that artift and Simon Vouet, he went to Italy in the year 1633, or beginning of 1634.

At firft he employed himfelf in painting landfcapes, buildings, and ancient ruins; with great refolution perfevering in his defire to be a painter, although abandoned by his parents through refentment for his rejection of a profeffion they had chofen for him. In Rome he was deftitute of friends and acquaintance for the firft two years of his refidence there, and for the greateft part of that time he fubfifted on bread and cheefe, diverting uneafy reflections by an indefatigable purfuit of painting.

The arrival of Peter Mignard, afterwards fo celebrated, who had been his friend and fellow ftudent under Vouet, fet him more at eafe. They united in the ftricteft ties of friendfhip, lived together in the fame houfe, and were commonly known in Rome by the name of the *Infeparables*.

They principally ftudied the works of Raphael, and the antiques: but other artifts of great celebrity had alfo a fhare of their attention, particularly Titian and Carracci: the former of whom Du Frefnoy had great efteem for, and copied feveral of his works; endeavouring to imitate him in his colouring, as he did Carracci in his defign. In the progrefs of their ftudies, Mignard appeared to poffefs fuperior talents in practice, while Frefnoy, who was perhaps more of a reafoner, entered more into the rules, the theory, and hiftory of the art. Each communicated to the other his fentiments and obfervations; Du Frefnoy furnifhing his friend with noble and excellent ideas, and receiving in return advice and inftructions in the beft mode to realize his inventions with expedition and effect.

Whilft he lived in Rome, he painted feveral pictures of the ruins of the Campo Vaccino. One of a young Athenian woman going to fee the monument of her lover. Æneas carrying his father, &c. &c. But poetry fhared with painting his time and thoughts too much to allow him ever to make a fhining figure in the practice of the latter profeffion. As he, by a ftudious examination of good works, penetrated into the fecrets of the art, he wrote down his obfervations; and having fatisfied himfelf with the knowledge he had acquired of its theory, he formed the defign of writing a poem upon it, which he employed many years upon, confulting the beft writers, and examining the beft pictures, to perfect his information, and render his labours truly ufeful.

About the year 1653 he travelled in company with Mignard (according to Felibien) through Lombardy to Venice, and there painted fome pictures, imitating the ftyle and colour of Titian with confiderable fuccefs. Here the two friends feparated, Mignard returning to Rome, and Du Frefnoy to France. He read his poem to the beft painters in all places through which he paffed, and particularly to Albano, and Guercino, then at Bologna; and he confulted feveral men famed for their fkill in polite literature.

Returned to Paris in 1656, he met with confiderable fuc-

cefs in painting; it being then the fafhion to paint the walls and cielings of rooms, he was much engaged in that degrading application of the art. He painted both figures and landfcapes, and fometimes alfo gave defigns for architecture. But his works in both thefe arts are difregarded when compared with the excellencies of other artifts. His reputation for genius and talent refts upon his poem, which, after many years of revifion and correction, he proceeded to prepare for publication.

Though he had finifhed this didactic labour before he left Italy, and communicated it to the beft judges of that country; yet after his return to France, he continued to revife it, with a view to treat more at length fome things which did not feem to him fufficiently explained. And though he was defirous to fee his work in print, yet having written it in Latin, he thought it improper to publifh it without a French tranflation, which he deferred undertaking from time to time, out of diffidence of his fkill in his own native language, which he had in fome meafure loft by his long refidence in Italy. Monf. du Piles was therefore at laft induced, at his defire, and by the merit of the poem, to tranflate it into French: his verfion being revifed by Du Frefnoy himfelf, who had begun a commentary upon it, when he was feized with a palfy, and after languifhing four or five months under it, he died at the houfe of one of his brothers at Villiers-le-bel, four leagues from Paris, in 1665, at the age of 54, and was interred in the parifh church. He had quitted his lodgings at Monf. Potel's, in the ftreet Beautreilly, on Mignard's return from Italy in 1658, and the two friends lived together from that time till the death of Du Frefnoy.

His poem was not publifhed till three years after his death; when it was printed in Paris, in duodecimo, with the French verfion, and remarks of Monf. Du Piles, and has been juftly admired for its elegance, perfpicuity, and the utility of the inftruction it contains. In 1694, Dryden was induced to make a profe tranflation of it into Englifh, which he accompanied with his ingenious parallel between poetry and painting. It was again tranflated into Englifh by Mr. Wills, a painter, who gave it in metre without rhyme. He attempted to produce the fenfe of his author in an equal number of lines, and thus cramped his own fkill; and produced a work unequal in itfelf, in which, however well he appears to have underftood the original text, he fails to imprefs it on his reader. It is now almoft totally forgotten.

More ample juftice has been done in our language to the talents of Du Frefnoy, by our late fkilful poet William Mafon, M. A.; by whom, in 1782, he was firft clothed in an Englifh drefs fuited to his elevated pretenfions. And ftill greater honour was done to him by the hand of that extraordinary genius of our ifle in the art of painting, fir Jofhua Reynolds, for whofe more valuable remarks upon the moft important points in the poem, Mr. Mafon was induced to difcard thofe of Monf. Du Piles. This tranflation is written in heroic verfe, and is accompanied by fifty-nine notes from the pen of fir Jofhua Reynolds.

By the union of the talents of two men fo renowned in the arts of poetry and painting, Du Frefnoy is rendered for ever dear to the Englifh reader; and the thorough knowledge he has exhibited of the beft principles of the art of painting, become more agreeably and more extenfively diffufed. See Life of Du Frefnoy by Wills and Mafon.

FRESTA, in *Geography*, a town of Sweden, in the province of Upland; 21 miles S.E. of Upfal.

FRET, in *Architecture*, a Grecian decoration, confifting of ftraight grooves or fillets, running at right angles in the manner of a fpiral, or turning round in various directions, repeating the fame turns or forms in compartments, or at various intervals. The fret is one of the moft ancient ornaments, (fee Stewart's Antiquities of Athens,) in which a great variety of the moft beautiful will be feen in various parts of that work.

The appellation is faid to have been derived from this circumftance, that the French word *frette* literally fignified the timber-work of a roof, which confifts chiefly of beams, rafters, &c. laid acrofs each other, and, as it were, fretted.

Fret, or *Frette*, in *Heraldry*, is a bearing confifting of fix bars, croffed, and interlaced, fret-wife.

Guillim derives the word from the French *rets*, net: but the reader will eafily furnifh himfelf with a better etymology from the word fret, in architecture.

He bears diamond, a fret topaz; the coat armour formerly of the lord Maltravers, and now quartered by the duke of Norfolk. When it confifts of more than fix pieces, the number muft be fpecified.

Some call this the "true lover's knot;" others "Harrington's knot," becaufe it is their arms; and "nodo firmo," the motto. Gibbon is for calling it "heraldorum nodus amatorius."

Fret, in *Mufic*, is a ftring tied round the neck of fome inftrument, fuch as the viol de gamba, and lute, to afcertain the precife part of the finger-board, where the fingers of the left hand are to be placed.

Fret-*work*, an enrichment of frets, or a place adorned with fomething in the manner thereof. See Fret.

Fret-work is fometimes ufed among us to fill up and enrich flat, empty fpaces; but it is principally practifed in roofs, which are fretted over with plafter-work.

The Italians alfo apply it to the mantlings of chimneys with great figures: a cheap piece of magnificence, and as durable almoft within doors, as harder matters in the weather.

FRETTS, in *Mineralogy*, a term ufed by our miners to exprefs the worn fide of the banks of the rivers in mine-countries, where they fearch for the fhoad ftones, or grewts, wafhed down from the hills, in order from thence to trace out the running of the fhoad up to the mine. Phil. Tranf. N° 69.

FRETTY, or Frette, in *Heraldry*, is where there are divers bars laid acrofs each other.

Fretty is of fix, eight, or more pieces. Azure, fretty of eight pieces, or, the coat of the lord Willoughby.

Columbiere obferves, that fretty, abfolutely ufed, without any addition, is fuppofed to be of fix pieces; that is, fo many bars or pieces croffing each other, which, therefore, need not be expreffed; but if there be more, as much muft be mentioned. And yet Guillim has azure, fretty of fix, argent; the coat of the ancient lords Elthingham, of Suffex.

FRETUM, Streight, or *Straight*, in *Geography*. See Straight.

Fretum *Britannicum*, or *Gallicum*, in *Ancient Geography*, denotes the ftreights between Dover and Calais.

Fretum *Gaditanum*, the *Streights of Gibraltar*, denotes the ftreights between Spain and Africa, connecting the Mediterranean fea with the ocean; called alfo *Fretum Herculaneum*.

FRETZENDORF, in *Geography*, a town of Germany, in the bifhopric of Bamberg; feven miles N.W. of Burg Eberach.

FREUDAH, a town of Algiers; 10 miles S. of Mafcar.

FREUDENBERG, a town of Pruffia, in Natangen.—Alfo, a town of Germany, in the principality of Naffau-Siegen.—Alfo, a town of Bavaria.—Alfo, a town of Germany,

many, in the county of Wertheim on the Mayn.—Alſo, a town of Pruſſia, in Ermeland.

FREUDENSTADT, a town of Wurtemburg, founded in 1600, as an aſylum for the Proteſtants who were perſecuted in Germany; ſituated in the Black foreſt, fortified in the modern manner, and defended by a citadel. In 1796 it was taken by the French; 24 miles E.S.E. of Straſburg. N. lat. 48° 28'. E. long. 8° 25'.

FREUDENTHAL, or BRUNTHAL, a town and lordſhip of Sileſia, in the principality of Troppau; celebrated for its breed of horſes and manufacture of fine linen; 17 miles W. of Troppau. N. lat. 49° 50'. E. long. 17° 21'.

FREUDENTHAL, a town of Germany, in the principality of Wurzburg; five miles W.N.W. of Volckack.

FREVENSTEIN, a town of the duchy of Stiria.

FREVENT, a town of France, in the department of the ſtraits of Calais; ſix miles W. of Arras.

FREVILLE, a town of France, in the department of the Lower Seine; five miles N.E. of Caudebec.

FREUNDSHEIM, a town of Germany, in the Tyrol; 24 miles W. of Inſpruck.

FREUSBURG, a town of Germany, in the county of Sayn; ſeven miles S.E. of Siegen.

FREYBERG, or PRZIBOR, a town of Moravia, in the circle of Prerau; 36 miles E. of Olmutz. N. lat. 49° 34'. E. long. 18° 15'.

FREYBERG, or *Friedberg*, a town of Germany, and capital of the circle of Erzgeburg, ſeated on a branch of the Moldaw, near mountains which ſeparate the country from Bohemia. It contains ſix churches, 2000 houſes, and 60,000 inhabitants. In its environs are mines of copper, tin, lead, and ſilver, which produce about 10,000 rix-dollars annually. The adjacent ſoil, though mountainous, is fertile; 19 miles W.S.W. of Dreſden. N. lat. 50° 53'. E. long. 13° 18'.

FREYBERG, mountains of Switzerland, in the canton of Glarus, which divide the valley, forming a principal part of this canton, about a league S. of the burgh of Glarus, at the point where the two rivers, Linth and Sernft, unite.

FREYBERG, or *Freyburg*, a town of Sileſia, in the principality of Schweidnitz, near the river Polonitz; ſeven miles W. of Schweidnitz. N. lat. 50° 42'. E. long. 16° 16'.

FREYBURG, a town of Germany, in Thuringia, on the Unſtrutt; 16 miles S. of Halle. N. lat. 51° 14'. E. long. 11° 54'.

FREYDENBACH, a town of Germany, in the principality of Anſpach.

FREYE-AEMTER, a country of Switzerland, encompaſſed by the cantons of Zurich, Berne, Lucerne, and Zug, and the county of Baden; anciently called the "county of Rori, or Waggenthal;" belonging to the counts of Hapſburg, and gained in conqueſt by the Swiſs in the year 1415. The inhabitants, amounting in number to about 20,000, are Roman Catholics, and they are chiefly employed in the cultivation of their fields and vineyards. The country is about ſeven or eight leagues in length, and three or four in breadth.

FREYEN, a ſmall iſland in the North ſea, near the coaſt of Norway. N. lat. 63° 42'.

FREYENSEEN, a town of Germany, in the principality of Solms; formerly an imperial town.

FREYENSTADT, a town of Germany, in the lordſhip of Breiteneck, ſituated on the Schwarzach; 20 miles S.E. of Nuremberg. N. lat. 49° 9'. E. long 11° 15'.

FREYENTHURN, a town of Middle Carniola, on the Kulp; ſeven miles E. of Rudolfswerth.

FREYENWALDE, a town of Germany, in the Middle Mark of Brandenburg, on the Oder. The trade of the inhabitants, which is conſiderable, is carried on in fiſh, corn, lace, linen, medicinal waters, and alum; 32 miles N.E. of Berlin. N. lat. 52° 51'. E. long. 14° 5'.

FREYHAN, a town and lordſhip of Sileſia, in the principality of Oels, on the borders of Pruſſia; 24 miles N. of Oels. N. lat. 38° 12'. E. long. 17° 20'.

FREYHEIL, a town of Bohemia, in the circle of Konigingratz, near which are warm baths.

FREYHOFF, a town of Carniola, on the Kulp; ſeven miles S.W. of Landſtrap.

FREYHUNG, a town of Germany, in the principality of Sulzbach; 10 miles N.E. of Sulzbach.

FREYLA, a town of Spain, in the country of Grenada; 18 miles N.N.E. of Guadix.

FREYLING, a town of Auſtria; four miles E.S.E. of Efferding.

FREYSINGEN, or FRISINGEN, *Biſhopric of*, an eccleſiaſtical principality of Germany, in the circle of Bavaria, ſituated between the cities of Munich and Landſhut, founded by St. Corbinien, who was created biſhop by pope Conſtantius III. about the year 710. It includes within its territories the town of Freyſingen, the county of Iſmaning, the lordſhip of Burgkrain, and the county of Werdenfeils. In 1801 this biſhopric was ſecularized, and granted to the elector (now king) of Bavaria. The town of Freyſingen is ſituated on the Moſach, not far from the Iſer, partly at the foot of a mountain, and partly on its ſummit. The epiſcopal palace and cathedral church, which are beautiful edifices, are ſituated in the upper part of the town; taken by the French in 1796; 17 miles N.N.E. of Munich. N. lat. 48° 20'. E. long. 11° 44'.

FREYSTADT, a town of Pruſſia, in the province of Oberland; 80 miles S.W. of Konigſberg.—Alſo, a town of Sileſia, in the principality of Glogau, containing a Roman catholic church, a convent, and a Lutheran church and ſchool. Good cloth is manufactured in this town; 12 miles N.E. of Sagan. N. lat. 51° 44'. E. long. 15° 25'.

FREYSTADTEL, a town of Sileſia, in the principality of Teſchen; ſeven miles W.N.W. of Teſchen. N. lat. 49° 49'. E. long. 18° 34'.

FREYSTATT, or FREUSTADT, a town of Auſtria; 82 miles W. of Vienna. N. lat. 48° 30'. E. long. 14° 25'.

FREYSTATTEL, a town of Moravia, in the circle of Hradiſch; 20 miles N.E. of Hradiſch.

FREYSTATTL, a caſtellated town of Hungary, on the Waag.

FREYSTETT, or FREYSTAETT, a town of Germany, in the county of Catzenelnbogen, on the Mayn; where Roman Catholics, Lutherans, and Calviniſts, are allowed the free exerciſe of their religion; 12 miles N.W. of Darmſtadt.

FREYUNG, a town of the biſhopric of Paſſau; 14 miles N. of Paſſau.

FREYWALDE, a town of Sileſia, in the principality of Neiſſe; 15 miles S. of Neiſſe. N. lat. 50° 5'. E. long. 17° 5'.—Alſo, a town of Sileſia, in the principality of Sagan; 12 miles S.W. of Sagan.

FREZIER, AMEDEE-FRANCIS, in *Biography*, was born at Chamberry in 1682, and was intended by his parents for the profeſſion of the law, but his own inclination led him to devote the ſtrength of his talents to mathematics. He ſoon qualified himſelf for the engineer ſervice of his country, and was employed, in 1711, by the court, in a ſurvey of the Spaniſh colonies of Peru and Chili; and on his return from thoſe countries he publiſhed a "Voyage to the South Sea," which obtained him a high degree of credit. After this

this he was entrusted with the superintendence of several important fortifications, and for the great ability exhibited on this, and other occasions, in the service of government, he was rewarded with the cross of St. Lewis, and made lieutenant-colonel in the army. In 1740 he was appointed director of all the fortified places in Britanny. He died at Brest in the year 1773. He was author of "Traité des Feux d'Artifice." "Elemens de Stereotomie," in two volumes 8vo. This last was enlarged under the title of "Theorie et Pratique de la Coupe des Pierres et des Bois," in three volumes 4to. He is highly esteemed as an author, particularly for his last work.

FREZIERA, in *Botany*, in memory of Amadeus Francis Frezier, an engineer in the service of Louis XIV., who published a Voyage to Chili and Peru, and died in 1773, at the age of 91. He made some botanical observations, and introduced the Chili Strawberry into Europe; see FRAGARIA CHILOENSIS. He was greatly at variance with Father Feuillée, who attacked him in the preface of his own Voyage, and was answered by Frezier in a subsequent edition of his publication; see FEUILLÉE.—Swartz. Ind. Occ. v. 2. 971. Willd. Sp. Pl. v. 1179. (Eroteum; Swartz. Prod. 85., Schreb. 807. See EROTEUM.)—Class and order, *Polyandria Monogynia*. Nat. Ord. *Aurantia*, Juss.

Gen. Char. *Cal.* Perianth of five ovate, concave, incumbent, permanent leaves. *Cor.* Petals five, roundish, inclining to ovate, concave, undivided, spreading. *Stam.* Filaments numerous (30), inserted into the receptacle, shorter than the petals, erect, thread-shaped; anthers roundish, minute. *Pist.* Germen superior, ovate, downy; style solitary, erect, rather longer than the stamens, awl-shaped, three or five-cleft at the summit, permanent; stigmas blunt, simple, reflexed. *Peric.* Berry roundish, dry, smooth, pointed with the permanent style, of three to five cells. *Seeds* three or four in each cell, oblong, slightly compressed.

Eff. Ch. Calyx of five leaves. Petals five. Style three to five-cleft. Berry dry, of three to five cells, with many seeds.

Obs. The inflorescence, flower and habit are those of *Thea*, but the fruit is different. *Swartz.*

1. F. *theoides.* Sw. Ind. Occ. v. 2. 972.—"Leaves lanceolate, somewhat ovate, bluntly serrated, smooth. Flowers axillary, solitary."—Native of lofty mountains in the southern part of Jamaica. A *tree* from 20 to 40 feet high, with a smooth greyish bark, and upright sub-divided branches. *Leaves* alternate, stalked, pointed, ribbed, smooth, shining on the upper side, rather rigid. *Flowers* few, stalked, drooping, whitish, resembling those of the tea shrub, but only half their size. They appear in June and July, and the berries ripen in October. The leaves are said by Swartz to be astringent, and to have precisely the taste of green tea. They might perhaps prove a better substitute for the Chinese plant than the leaves of ash, sloe, or whatever else serves to adulterate that valuable article of commerce in Europe.

2. F. *undulata.* Sw. Ind. Occ. v. 2. 974. (Eroteum undulatum; Vahl. Symb. v. 2. 61.)—"Leaves elliptic-lanceolate, pointed, serrated, smooth. Flowers axillary, clustered."—Native of woods on the highest mountains of the West Indies. An elegant *tree*, often rising to the height of 50 feet, the *branches* nearly erect, brown, with elevated white spots. *Leaves* about four inches long, serrated and undulated, finely veined, smooth, palest beneath; their stalks about an inch long, reddish, channelled above, smooth. *Flower-stalks* somewhat umbellate, rarely solitary. *Flowers* whitish. *Swartz.*

3. F. *reticulata.* Humboldt and Bonpland Plant. Æquinoct. v. 1. 22. t. 5.—"Leaves ovato-lanceolate, serrated, downy and reticulated beneath. Flowers axillary two or three together, stalked."—Native of Peru, on the Andes, near the town of Almagner. *Stem* about 18 feet high, bearing many downy, reddish, leafy, warty *branches*. *Leaves* about three inches long, serrated; smooth above; finely downy and reticulated beneath. *Footstalks* an inch or more in length, downy. *Flower-stalks* two or three together, downy, as well as the *calyx*. *Petals* white, scarcely longer than the calyx. *Fruit* of four cells.

4. F. *hirsuta.* Leaves elliptic-lanceolate, bluntly serrated, smoothish with a hairy rib; unequal at their base. Flowers axillary, two or three together, stalked. Branches hairy.—Native of high cool mountains, where the atmosphere is always damp, in the island of St. Vincent, from whence it was sent by Dr. Alexander Anderson to A.B.Lambert, esq. from whose rich herbarium we have been favoured with a specimen. It seems very nearly akin to the last, but the young *branches* are extremely hairy, the *leaves* smaller, scarcely rough beneath except the rib, and remarkably unequal at their base. The *flowers* moreover are scarcely half so large as in F. *reticulata*, with very hairy stalks and calyx.

5. F. *canescens.* Humb. and Bonpl. Pl. Æquinoct. v. 1. 25. t. 6.—Leaves elliptical, tapering at each end, minutely serrated, hoary beneath. Flowers solitary or in pairs, stalked.—Native of the Andes of Peru, between the towns of Quito and Ybarra. A *tree* 18 feet high. *Branches* spreading, smooth, except at their extremities, where they are finely downy. *Leaves* three or four inches long, somewhat revolute, very finely serrated, hoary and downy at the back. *Flowers* rather large, mostly solitary, white, with downy stalks and calyx. *Petals* externally downy, twice as long as the calyx. *Fruit* of three cells.

6. F. *chrysophylla.* Humb. and Bonpl. Pl. Æquinoct. v. 1. 27. t. 7.—Leaves elliptic-lanceolate, pointed, entire; downy beneath. Flowers two or three together, stalked.—Native of cold parts of the Andes of Peru, near the town of Popayan. Remarkable for its entire *leaves*, which are smooth above, and of a fine golden hue at the back, with an appearance of two parallel lines on each side of the rib, but this is only caused by the arrangement of the hairs. *Petals* whitish, pointed, more than twice as long as the calyx.

7. F. *sericea.* Humb. and Bonpl. Pl. Æquinoct. v. 1. 29. t. 8.—Leaves ovate, pointed, finely serrated, silvery beneath, on short stalks. Flowers sessile.—Very frequent in cold parts of the province of Pasto in Peru, between the towns of Quito and Popayan. A *tree* 30 feet high, with angular smooth *branches*. *Leaves* nearly sessile, four inches long, broad at the base, smooth above, clothed beneath with white silky hairs, slightly veined. *Flowers* two or three together, sessile, small. *Calyx* smooth. *Petals* twice as long as the calyx, white, obtuse. *Berry* of from three to five cells.

8. F. *nervosa.* Humb. and Bonpl. Pl. Æquinoct. v. 1. 31. t. 9.—Leaves elliptic-ovate, pointed, serrated; veiny and somewhat hairy beneath. Flowers many together, stalked.—Native of cold situations in the province of Pasto in Peru. A *tree* above thirty feet high, with nearly smooth *branches*. *Leaves* marked with numerous transverse veins, and slightly hairy, beneath. *Flowers* small, white. The wood is valuable, and much used in building.

FRIABLE SOIL, in *Agriculture*, is such as has the particles readily broken down, and reduced into a powdery state. See SOIL.

FRIANGOMBI, in *Geography*, a town of Africa, in Congo, on the Zaine, near Lembo.

FRIAR, or Frier, by the Latins called *frater*, the Italians *fra*, and the French *frere*, that is, *brother*, is a term common to the monks of all orders; founded on this, that there is a kind of fraternity, or brotherhood, presumed between the several religious persons of the same convent or monastery.

The kinds of friars are very numerous: Augustine friars; Dominican, or black, or preaching friars; Franciscan, or grey, or begging friars; and Carmelites, or white friars.

Friar, in a more peculiar sense, is restrained to such monks as are not priests; for those in orders are usually dignified with the appellation of *father*.

Friars, or Friers, *observant*, *fratres observantes*, were a branch of the Franciscans; thus called, because not combined together in any cloyster, convent, or corporation, as the conventuals are, but only agreed among themselves to observe the rules of their order, and that more strictly than the conventuals did, from whom they separated themselves out of a singularity of zeal, living in certain places of their own chusing.

Friar's *Cowl*, in *Botany*. See Arum.

Friar's *Head*, in *Geography*, a cape on the E. coast of Antigua. N. lat. 17° 11'. W. long. 61° 22'.

Friar's *Hood*, a mountain of Ceylon, near the coast; 68 miles E. of Candy.

FRIARY *of the Holy Trinity*. See Trinity.

FRIAS, in *Geography*, a town of Spain, in Old Castile, situated on an eminence, near the Ebro; 20 miles N. N. E. of Burgos. N. lat. 42° 40'. W. long. 3° 2'.

FRIBURGH, Fridburgh, or *Fritheborg*, among our Anglo-Saxon ancestors, denoted the same as frank-pledge did after the time of the conquest.

"Præterea est quædam summa et maxima securitas, per quam omnes statu firmissimo sustinentur, *viz.* ut unusquisque stabilitat se sub fidejussionis securitate, quam Angli vocant *freoborghes*; soli tamen Eboracenses dicunt eandem *tienmannatale*, quod sonat Latine decem hominum numerum." LL. Edw. II. ap Lamb.

Every man in this kingdom was anciently associated in some *decennary*, (which see,) or company of ten families, who were pledged, or bound for each other, to keep the peace, and observe the law. (See Tithing.) If any offence was done by one, the other nine were to answer it; that is, if the criminal fled from justice, they had thirty days allowed to apprehend him; if he was not taken in that time, he who was the friburgh, *i. e.* the principal pledge of the ten, should take two of his own number, and the chief pledges of three neighbouring friburghs, with two others out of each of the said friburghs, who were to purge themselves, and their friburgh, of the forfeiture and flight of the criminal. If they could not do this, the principal pledge, with the other eight, were to make satisfaction.

Great men were not combined in any ordinary decenna, or dozen, as being deemed a sufficient assurance for themselves and their menial servants.

FRIBURG, or Freyburg, in *Geography*, a town of Germany, in the circle of Swabia, and capital of the Austrian Brisgaw, (ceded to the duke of Modena by the treaty of Campo Formio in 1797, and that of Luneville in 1801,) situated at the foot of a stony mountain on the river Traisam. This town was founded, in 1118, by Berchtold III. duke of Zæringen, from whom it came to the counts of Furstenberg, with whom it had many disputes on account of its privileges; but at last it purchased its freedom for 20,000 marks of silver. This sum was advanced by the house of Austria, so that the town became subject to that family. The French took and dismantled it in 1744. It was again taken by the French in 1796, and soon surrendered to the archduke. The streets are broad and well paved; the principal church is a superb edifice. Here is an university, founded in 1457, by Albert IV. duke of Austria, with an academy, and five colleges dependent upon it; it has 10 convents, a commandery of the Teutonic order, and 13 churches. The principal business of the town is that of polishing crystals and precious stones; 34 miles S. S. E. of Strasburg. N. lat. 48° 2'. E. long. 7° 54'.

Friburg, or Freyburg, called *Friburg* in *Uckland*, by way of distinction from *Friburg in the Brisgaw*, a town of Switzerland and capital of a canton, to which it gives name. This town was built, in 1179, by Berchtold IV., duke of Zæringen, and endowed by him with considerable privileges. In 1218, the sovereignty of it descended to Ulric of Kyburgh, in right of his wife Anne, sister of the last duke Berchtold V. By marriage it came into the possession of Eberhard, count of Hapsburg-Lauffenburg, who sold it to his cousin Rhodolph of Hapsburgh, afterwards emperor. During this period a continual rivalship subsisted between Bern and Friburg; but at length all differences were composed, and in 1403 the two cities concluded a perpetual alliance. Friburgh continued under the dominion of Austria until the middle of the 15th century, when it put itself under the protection of the duke of Savoy. From this era it occasionally assisted the cantons against the house of Austria; but soon after the battle of Morat, in which its troops had a share in the victory then obtained, it became a free and independent republic, and, in 1481, it was admitted a member of the Helvetic confederacy. The situation of Friburgh is one of the most picturesque and wild in Switzerland; as it stands partly in a small plain, partly on bold aeclivities, on a ridge of rugged rocks, half encircled by the river Sane; and is so entirely concealed by the circumjacent hills, that the traveller scarcely catches the smallest glimpse, until he bursts upon a view of the whole town from the overhanging eminence. The fortifications, consisting of high walls and towers, inclose a circumference of about four miles; within which space the eye comprehends a singular mixture of houses, rocks, thickets, and meadows, varying instantly from wild to agreeable, from the bustle of a town to the solitude of the deepest retirement. The Sane flows in a serpentine course, so as to form, within the space of two miles, five angles, between which the different parts of the current are nearly parallel to each other. On all sides the descent to the town is extremely steep, and in one place the streets even pass above the roofs of the houses. Many of the edifices are raised in regular gradation like the seats of an amphitheatre. The most extraordinary point of view is from the Pont-neuf. The houses, constructed with a grey sandstone, brought from a neighbouring quarry, are neat and well-built; but the whole town has a dull and inanimate appearance. Among the few objects worthy of particular notice are, the cathedral, an elegant Gothic edifice, erected in the latter end of the 14th century, and remarkable for the height and solidity of the tower. The town-house, an ancient building, and a lime-tree planted in the middle of the principal square by a soldier, as tradition reports, June 22d 1477, on his return from the battle of Morat, and regarded as an emblem of Swiss liberty. The society of Friburgh is very agreeable; the gentry are frank and hospitable, and blend French politeness with great simplicity of manners. The bishop of Lausanne, called here the bishop of Friburgh, resides in this city. Under the old establishment, he was appointed by the pope, usually at the recommendation

mendation

mendation of the French court ; and his revenues commonly amounted to about 400*l.* per annum. His diocefe extends over the whole canton, and part of that of Soleure. This canton is entirely Catholic, and its population, in 1785, was eftimated at 57,589 perfons, the town containing 5,011. According to the ftatement of Mr. Planta in his "Hiftory of the Helvetic Confederacy," the canton of Friburgh, before the revolution, confifted of 467 fquare miles, and contained 73,000 inhabitants. This canton contains a fmall portion of arable land, but abounds in paftures ; accordingly, its principal articles of exportation confift in horned cattle, cheefe, butter, and hides. Its cheefe is famous under the name of Gruyeres, derived from that of the diftrict in which it is made. (See Gruyeres.) It may be eftimated upon an average, that the whole canton annually fupplies pafture for 37,000 cows and oxen. It the year 1798, the town furrendered to the French army, under the command of general Pigeon ; and as foon as the French took poffeffion of it, a provifional government, elected by the diftricts of Friburgh, fuperfeded the former magiftracy, confifting of a council of 200. According to the conftitution of 1801 it formed, with the addition of the bailliages of Morat and Schwartzenburgh, one of the 17 departments or cantons of Switzerland, deputing four reprefentatives to the general diet. By the conftitution of 1803, the force which this canton is required to fupply confifts of 620 men. Friburgh is diftant 16 miles S. W. from Berne, and 27 N. E. from Laufanne. N. lat. 46° 50′. E. long. 6° 48′.

Friburg, a town of Bavaria; 15 miles S. S. E. of Brannau.

FRIBUS, a town of Bohemia, in the circle of Einbogen; nine miles W. of Joachimftel.

FRICALA, a town of European Turkey, in Theffaly ; 35 miles W. of Lariffa.

FRICASSEE, a difh, or mefs, haftily dreffed in a frying-pan, and feafoned with butter, oil, or the like.

The word is French, formed of the Latin *frixatura*, frying. Others will have fricaffee formed in imitation of the noife made by butter, or other fat, when melted in the pan.

We fay a fricaffee of pullets, or rabbits, of tench, of tripe, of frogs, of eggs, of peas, &c.

FRICCIUS, Melchior, in *Biography*, a phyfician, who practifed his profeffion at Ulm in the latter part of the feventeenth century. Refpecting the particular circumftances of his life, little has been recorded ; but he left feveral interefting works on medical fubjects, of which his treatife on the medicinal properties of poifons deferves particular mention. He was one of the firft to demonftrate to the profeffion, from reafon, experience, and authority, that poifonous fubftances may be employed without danger, both internally and externally ; and that, deleterious as they are in certain quantities and on certain occafions, the prudent phyfician may derive from them the moft efficacious remedies againft the moft obftinate difeafes. The poifons, which Friccius arranged in the clafs of remedies, are principally arfenic, corrofive muriate of mercury, euphorbium, aconite, cicuta, bella donna, hyofciamus, &c. Although the fears and prejudices of his contemporaries led them to difcredit his facts, and to look upon his reafoning as vifionary, his pofterity have realized his ftatements, in confequence of the experiments of Van Swieten, Storck, Fowler, &c. ; and thefe fubftances are now reforted to, as fome of the moft active agents of the materia medica. The following are the titles of the publications of Friccius. 1. "Differtatio Medica de Pefte, feu, nova Methodus cognofcendi et curandi Peftem," Ulm, 1684.—2. "Icon Podagræ, reprefentans morbi podagrici hiftoriam, caufas, prognofin, et curationem," Ibid. 1693.—3. "Tractatus Medicus de Virtute Venenorum Medicâ," Ibid. 1693, 1701.—4. "De Colica fcorbutica," Ibid. 1696.—5. "Paradoxa Medica in quibus plurima curiofa et utilia contra communes Medicorum Opiniones pertractantur," Ibid. 1699.—Eloy. Dict.

FRICENTI, in *Geography*, a town of Naples, in Principato Citra, the fee of a bifhop, united with Avellino ; 18 miles S.E. of Benevento. N. lat. 40° 59′. E. long. 15° 2′.

FRICHE, or Frische, James du, in *Biography*, a learned French Benedictine monk, was born in Normandy in the year 1641. He embraced the ecclefiaftical life, and purfued his ftudies with fo much diligence and ardour, that he was felected by his fuperiors as a proper perfon for fuperintending fome of the noble editions of the fathers which they fent into the world. He was fixed on to publifh the works of St. Ambrofe, which appeared at Paris, in two volumes folio, in 1686, and, in 1690, enriched with notes, various readings, remarks, &c. Friche was afterwards employed to prepare for the prefs a new edition of the works of St. Gregory Nazianzen, but he died before he could complete his plan, which happened at Paris in 1693, when he was about fifty-two years of age. Friche was likewife author of the "Life of St. Auguftine," prefixed to the Benedictine edition of the works of that father. He had likewife filled the profefforfhip of rhetoric at Thiron with much reputation. Moreri.

FRICIUM, of *frico*, *I rub*, in *Pharmacy*, a name given to fuch medicines as are intended to be rubbed into the feveral parts of the body. The ancients had three kinds of fricia, the dry, the foft, and the liquid ; the firft was ufed in the way of fumigation, the fecond was bound on the part with cloths, and the laft was ufed by way of embrocation.

FRICKTHAL, in *Geography*, a diftrict on the left bank of the Rhine, which the emperor of Germany agreed to cede to the French republic by the treaty of Campo Formio and that of Luneville.

FRICTION, in a general fenfe, the act of rubbing or grating the furface of one body againft that of another, called alfo *attrition*.

The phenomena arifing upon the friction of divers bodies under different circumftances, are very numerous and confiderable.

Mr. Hawkfbee gives us a number of experiments of this kind ; particularly of the attrition, or friction of glafs, under various circumftances, the refult of which was, that it yielded light, and became electrical.

All bodies by friction are brought to conceive heat ; many of them to emit light ; particularly a cat's back, fugar, beaten fulphur, mercury, fea-water, gold, copper, &c. but, above all, diamonds, which, when brifkly rubbed againft glafs, gold, or the like, yield a light equal to that of a live coal when blowed by the bellows. See Electrics and Electricity.

Friction, in *Mechanics*, denotes the refiftance a moving body meets with from the furface on which it moves.

Friction arifes from the roughnefs or afperity of the furface of the body moved on, and that of the body moving ; for fuch furfaces confifting alternately of eminences and cavities, either the eminences of the one muft be raifed over thofe of the other, or they muft be both broke and worn off ; but neither can happen without motion, nor can motion be produced without a force impreffed. Hence, the force applied to move the body is either wholly, or partly, fpent on this effect ; and confequently there arifes a refiftance, or friction, which will be greater, *cæteris paribus*, as the eminences

nences are the greater, and the ſubſtance the harder: and as the body, by continual friction, becomes more and more poliſhed, the friction diminiſhes.

Hence it follows, that the ſurfaces of the parts of machines that touch each other ſhould be as ſmooth and poliſhed as poſſible. However, it is found by experience, that the flat ſurfaces of metals, or other bodies, may be ſo far poliſhed as to increaſe friction; becauſe the attraction of coheſion becomes ſenſible, as we bring the ſurfaces of bodies nearer and nearer to contact. But, as no body can be ſo much poliſhed, as quite to take away all inequality; witneſs thoſe numerous ridges diſcovered by the microſcope on the ſmootheſt ſurfaces; hence ariſes the neceſſity of anointing the parts that touch with oil, or ſome other fatty matter.

FRICTION, *Laws of.* 1. As the weight of a body moving on another is increaſed, ſo is the friction.

This we ſee experimentally in a balance, which, when only charged with a ſmall weight, eaſily turns; but with a greater, a greater force is required.

Hence, if the line of direction of a moving body be oblique to the ſurface moved on, the friction is the greater; this having the ſame effect as an increaſe of weight.

And hence, again, as a perpendicular ſtroke or impreſſion is to an oblique one, as the whole ſine to the ſine of the angle of incidence; and the ſine of a greater angle is greater, and that of a leſſer leſs; the friction is the greater, as the line of direction approaches nearer to a perpendicular.

This is eaſily obſervable, and eſpecially in the teeth of wheels, which are frequently broke on this very account. The friction, therefore, is taken away, if the line of direction of the moving body be parallel to the ſurface. The truth of this principle, that the friction is proportioned to the weight of the moving body, has been diſputed; and ſome objections have been urged againſt it, an account of which will be given in the ſequel of the article.

2. The friction is leſs in a body that rolls than it would be if the ſame body were to ſlide, as is eaſily demonſtrated. For ſuppoſe a dented ruler, A B, *Plate* XXIX. *Mechanics*, *fig.* 1. and ſuppoſe a wheel D E to move along with it, with its teeth perpendicular to the circumference; if now the body were to ſlide, the tooth F, when it touched the ruler, would deſcribe a right line on its ſurface, and, as the tooth of the ruler H reſiſts the ſame, it could not proceed without removing or breaking either the tooth H, or that at F. And the ſame will hold in the ſliding of any rough ſurface upon another, where the whole friction will take place that can any way ariſe from the roughneſs of the ſurface. But if the wheel E D roll along the ruler, then the tooth H will no longer reſiſt its motion, only as it is to be hoiſted out of the cavity F over the eminence of the tooth H; and the ſame holds in the rubbing of any rough body over the ſurface of another.

Hence, in machines, leſt the friction ſhould employ a great part of the power, care is to be taken, that no part of the machine ſlide along another, if it can be avoided; but rather that they roll, or turn upon each other. With this view it may be proper to lay the axes of cylinders, not as is uſually done, in a groove, or concave matrix, but between little wheels, A B C D, *fig.* 2. moveable on their reſpective axes; for by this contrivance, the friction is transferred from the circumference of thoſe wheels to their pivots; and the friction may be ſtill diminiſhed farther, by making the axles of thoſe wheels reſt upon other friction-wheels that turn round with them. This was long ago recommended by P. Caſatus; and experience confirms, that we ſave much power by it. Hence alſo it is, that a pulley moveable on its axis reſiſts leſs than if it were fixed. And the ſame may be obſerved of the wheels of coaches, and other carriages.

From theſe principles, with a little farther help from the higher geometry, Olaus Roemer determined the figure of the teeth of wheels, that ſhould make the leaſt reſiſtance poſſible, and which ſhould be epicycloidal. And the ſame was afterwards demonſtrated by De la Hire. See WHEELS and WHEEL-CARRIAGES.

Hence in ſawing mills, the ſides of the wooden rectangle the ſaws are fitted into ſhould be furniſhed with rotulæ, or little wheels, which would greatly leſſen the friction; and the like in other caſes.

FRICTION, *Calculation of the Quantity of.* The friction is a point of the utmoſt importance in machines; and by all means to be conſidered in calculating their force: yet it is generally overlooked in ſuch calculations: but this is principally becauſe its preciſe value is not known. It is not yet reduced to certain and infallible rules; ſince it depends upon the ſtructure of bodies, the form of their prominent parts and cavities, and upon their rigidity, their elaſticity, their coherence, and other circumſtances. The common method is, barely to compute the advantage which a moving power has from the machine; either on account of its diſtance from a fixed point; or of the direction in which it acts. And in all the demonſtrations it is ſuppoſed, that the ſurfaces of bodies are perfectly ſmooth and poliſhed. Indeed the engineers expect, that in the practice they ſhould loſe part of the advantage of their force by the friction; but how much, it is ſuppoſed, nothing but the practice can determine. M. Amontons, indeed, (Mem. de l'Acad. Royale des Sciences 1699), has made an attempt to ſettle, by experiment, a foundation for the preciſe calculation of the quantity of friction, and Mr. Parent has confirmed it from reaſoning and geometry; but their theory, however warranted, is not generally and fully received.

M. Amontons' principle is, that the friction of two bodies, or the reſiſtance oppoſed to the motion of a body upon an horizontal ſurface, depends on the weight, or force, with which they bear on each other; and only increaſes as the bodies are more ſtrongly preſſed, or applied, againſt each other, or are charged with a greater weight; and that it is a vulgar error, that the quantity of friction has any dependence on the extent of the ſurfaces rubbed againſt each other; or that the friction increaſes as the ſurfaces do. Thus if a piece of wood four inches wide and one inch thick be ground, and thereby made as exactly fit to the ſurface of another fixed piece of the ſame wood, it will acquire the ſame weight to draw it along on the ſame, whether it be laid on its broad or narrow ſide: for though on the broad ſide there be four times the number of touching particles, (*cæteris paribus*), yet each particle is preſſed with but $\frac{1}{4}$ of the weight bearing on thoſe of the narrow ſide; and ſince four times the number multiplied by $\frac{1}{4}$ of the weight is equal to $\frac{1}{4}$ of the number multiplied by four times the weight, it is plain that the effect, that is, the reſiſtance, is equal in both caſes, and therefore requires the ſame force to overcome it.

Upon the firſt propoſal of this paradox, M. de la Hire had recourſe to experiments, which ſucceeded much in favour of the new ſyſtem. He laid ſeveral pieces of rough wood on a rough table; their ſizes were unequal; but he laid weights on them, ſo as to render them all equally heavy: and he found, that the ſame preciſe force, or weight, applied to them by a little pulley, was required to put each in motion, notwithſtanding all the inequality of the ſurfaces. The experiment ſucceeded in the ſame manner in pieces of marble, laid on a marble table. Upon this M. de la Hire

la Hire betook himfelf to the rationale of the thing; and has given us a phyfical folution of the effect. And M. Amontons has fettled a calculus of the value of friction; and the lofs fuftained by it in machines, on the foundation of the new principle.

In wood, iron, lead, and brafs, which are the principal materials ufed in machines, he finds the refiftance, caufed by friction, to be nearly the fame, when thofe materials are anointed with oil, or other fatty matter; (but this fact has been difputed by Mufchenbroek, and experiments urged in proof of the contrary:) and this refiftance, independent of the quantity of furface, he makes to be nearly equal to a third part of the force with which the bodies are preffed againft each other. Others have obferved, that if the furfaces be hard and well polifhed, the friction will be lefs than a third part of the weight; but if the parts be foft or rugged, it will be much greater. Let a very fmooth cylinder of wood A B, *fig.* 3. be laid on two well-polifhed and oiled or greafed fupporters C and D, and be charged with the weight of two pounds in the two equal balls G, H; it will require an additional weight x (equal to about a third part of the two pounds) to give motion to, or overcome the friction of the faid cylinder. But this additional weight, as it caufes a greater preffure of the cylinder, will increafe the friction, and require the addition of another weight y, equal to a third part of its own; for the fame reafon the weight y will require another z a third part of two pounds, and fo on *ad infinitum*.

Therefore, if the friction is precifely equal to a third of the weight, the firft weight, with all the additional ones, *viz.* 2, $\frac{2}{3}$, $\frac{2}{9}$, $\frac{2}{27}$, &c. will be a feries of numbers in geometrical progreffion decreafing: and the fum of all thefe terms, omitting the firft, *i. e.* the fum of the infinite number of additional weights $x + y + z$, &c. equal to one pound: fo that if the weight of the cylinder be inconfiderable, the way to overcome the friction will be to double the power G or H at once.

But if the cylinder moved on the two fmall gudgeons E and F, or on a fmall axis, the friction would be abated in the fame proportion as the diameter of thefe gudgeons is lefs than the diameter of the cylinder, becaufe in this cafe the parts on which the cylinder moves and rubs will have lefs velocity than the power which moves it in the fame proportion. See Wheel *Carriages*.

Befide the preffion, the magnitude whereof determines that of the friction, there is another circumftance to be confidered, *viz.* the velocity. The friction is the greater, and the more difficult to furmount, as the parts are rubbed againft each other with the greater fwiftnefs; fo that this velocity muft be compared with that of the power neceffary to move the machine, and overcome the friction. If the velocity of the power be double that of the parts rubbed, it acquires by that means an advantage that makes it double; or, which amounts to the fame, it diminifhes the contrary force of friction by one half; and reduces it to a fixth part of the weight or preffion. But this velocity M. Amontons only confiders as a circumftance that augments or diminifhes the effect of the preffion, *i, e.* the difficulty of the motion: fo that the friction ftill follows the proportion of the weight. Only, we are hereby directed to difpofe the parts of machines that rub againft each other in fuch a manner, as that they may have the leaft velocity poffible: and thus the diameter of the axis of a wheel fhould be as fmall as poffible, with regard to that of the wheel; in that the leffer the axis, the flower will be the motion of the furfaces rubbing againft each other; fince the velocity of a circular motion always goes diminifhing from the circumference to the centre: and, for the fame reafon, the teeth of dented wheels fhould be as fmall and thin as poffible; for a tooth catching on a notch, &c. rubs one of its fides againft a furface equal to its own; and is to difengage itfelf, in a certain time, by paffing over a fpace equal to the furface; confequently, the leffer the furface, the lefs fpace it has to move; the fmallnefs of the furface diminifhing the refiftance of the friction; not as it is a lefs furface that rubs, but as there is a lefs fpace to move. The following general propofition may be deduced from the preceding remarks, *viz.* That the refiftances arifing from friction are to one another in a ratio compounded of the preffures of the rubbing parts, and the times or velocities of their motions. The experiments of M. Amontons were confirmed by Boffut and Belidor. (Archit. Hydraul. v. i. c. 2.) And thofe of M. Bulfinger (Comment. Petropol. tom. ii.) furnifhed conclufions fimilar to thofe of Amontons, with this difference, that the refiftance of motion was equal to one-fourth of the force with which the rubbing furfaces were preffed together. M. Parent, fuggefting that friction is occafioned by fmall fpherical eminences in one furface being dragged out of correfponding fpherical cavities in the other, propofed to determine its quantity by finding the force which would move a fphere ftanding upon three equal fpheres. Accordingly this force was found to be to the weight of the fphere as feven to twenty, or nearly one-third of the fphere's weight. (Recherches de Mathem. et Phyf. 1713. tom. ii.) In inveftigating the phenomena of friction, M. Parent placed the body upon an inclined plane, and augmented or diminifhed the angle of inclination till the body had a tendency to move, and the angle at which the motion commenced, he called the angle of equilibrium. The weight of the body, therefore, will be to its friction upon the inclined plane as radius to the fine of the angle of equilibrium, and its weight will be to the friction on an horizontal plane, as radius to the tangent of the angle of equilibrium. (Mem. de l'Academ. 1704.) The celebrated Euler feems to have adopted the hypothefis of Bulfinger refpecting the ratio of friction to the force of preffion; and in two curious differtations, publifhed by him on this fubject, he has fuggefted many important obfervations, which have engaged the attention of profeffor Vince. (Sur le Frottement des Corps Solides; and Sur la Diminution de la Refiftance du Frottement, publifhed in the Memoires de l'Acad. Roy. des Sc., à Berlin. ann. 1748.) He obferves, that when a body is in motion, the effect of friction will be only one-half of what it is when the body has begun to move; and he fhews, that if the angle of an inclined plane be gradually increafed till the body which is placed upon it begins to defcend, the friction of the body at the commencement of its motion will be to its weight or preffure upon the plane, as the fine of the plane's elevation is to its cofine, or as the tangent of the fame angle is to radius, or as the height of the plane is to its length. But when the body is in motion, the friction is diminifhed, and may be found by the following equation,

$\mu = \text{tang.}\, a \frac{m}{15623\, n\, n\, \text{cof.}\, a}$; in which μ is the quantity of friction, the weight or preffure of the body being $= 1$, a is the angle of the plane's inclination, m is the length of the plane in 1000dth parts of a Rhinland foot, and n the time of the body's defcent. As to the caufe of friction, Euler nearly agrees with Parent; with this difference, that inftead of regarding the eminences and correfponding depreffions as fpherical, he fuppofes them to be angular, and imagines the friction to arife from the body's afcending a perpetual fucceffion of inclined planes.

Notwithftanding all the confirmations and illuftrations of the

the theory of friction propoſed by Amontons, neither the public, nor even the academy itſelf where it was propoſed, could be brought fully to acquieſce in it. Muſchenbroek and the abbé Nollet have concluded from experiments that the friction of bodies depends on the quantity of their ſurface as well as their weight. (Introd. ad Phil. Nat. vol. i. cap. 9. and Lect. Phyſ. Exp. tom. i. p. 241.) Nollet (Leçons de Phyſique, tom. iii.) and Boſſut (Traité Elementaire de Mecanique, § 3067.) have diſtinguiſhed friction into two kinds, that which ariſes from one ſurface being dragged over another, and that which is occaſioned by one body rolling over another. The reſiſtance in the firſt caſe is greater than that in the ſecond ; and it appears from the experiments of Muſchenbroek and others, that when a body is carried along with an uniformly accelerated motion, and retarded by the firſt kind of friction, the ſpaces are ſtill proportional to the ſquares of the times; but when the motion is effected by the ſame kind of friction, this proportionality between the ſpaces and the times of their deſcription does not obtain.

The above recited hypotheſis of M. Amontons has been adopted and confirmed by M. Camus, Deſaguliers, Ferguſon and others. Mr. Ferguſon found that the quantity of friction was always proportionable to the weight of the rubbing body, and not to the quantity of ſurface ; and that it increaſed with an increaſe of velocity, but was not proportioned to the augmentation of celerity. He found alſo that the friction of ſmooth ſoft wood, moving upon ſmooth ſoft wood, was equal to $\frac{1}{3}$ of the weight ; of rough wood upon rough wood $\frac{1}{2}$ of the weight ; of ſoft wood upon hard, or hard upon ſoft, $\frac{1}{5}$ of the weight ; of poliſhed ſteel upon poliſhed ſteel or pewter, $\frac{1}{4}$ of the weight ; of poliſhed ſteel upon copper, $\frac{1}{5}$, and of poliſhed ſteel upon braſs $\frac{1}{6}$ of the weight. (See Ferguſon's Tables and Tracts.)

Mr. Emerſon, in his Principles of Mechanics, deduces from experiments the following remarks relating to the quantity of friction : when a cubic piece of ſoft wood of eight pounds weight moves upon a ſmooth plane of ſoft wood, at the rate of three feet per ſecond, its friction is about one third of the weight ; but if it be rough, the friction is little leſs than half the weight : on the ſame ſuppoſition, when both the pieces of wood are very ſmooth, the friction is about one-fourth of the weight ; the friction of ſoft wood on hard, or of hard wood upon ſoft, is one-fifth or one half of the weight ; of hard wood upon hard wood one-ſeventh or one-eighth ; of poliſhed ſteel moving on ſteel or pewter, one-fourth ; moving on copper or lead, one-fifth of the weight. He obſerves in general, that metals of the ſame ſort have more friction than thoſe of different ſorts ; that lead makes much reſiſtance; that iron or ſteel running in braſs makes the leaſt friction of any ; and that metals oiled make the friction leſs than when poliſhed, and twice as little as when unpoliſhed. Deſaguliers obſerves that, in Monſ. Camus's experiments on ſmall models of ſledges in actual motion, there are more caſes wherein the friction is leſs than where it is more than one-third of the weight. See a table, exhibiting the friction between various ſubſtances, formed from his experiments in Deſ. Exp. Phil. vol. i. p. 193. See alſo his Account of the Friction of Engines, Carriages, &c. p. 133—138. p. 154—182. p. 458—460.

In order to eſtimate the quantity of friction in any engine, begin at the power and conſider the velocity and the weight at the firſt rubbing part, and determine the quantity of friction by the foregoing principles ; then proceed to the next rubbing part, finding the friction there, &c.

There is ſcarcely any ſubject or experiment, with regard to which different perſons have formed ſuch various concluſions, ſo that the nature and laws of friction are not yet ſufficiently clear and deciſive. It is granted that the preſſion has a great effect, and is, in many caſes, the only thing to be conſidered in friction ; but it will be hard to perſuade us abſolutely to exclude the conſideration of the ſurface.

If two bodies, with plain ſurfaces, ſuppoſed infinitely hard, and poliſhed, be moved along each other, the friction will be none, or infinitely ſmall ; but if, in lieu of ſuch ſuppoſition, which has no place in nature, we ſuppoſe two bodies, with rough, uneven ſurfaces, the difficulty of moving one of them on the other muſt either ariſe from this ; that the firſt is to be raiſed, in order to diſengage the parts catched or locked in the ſecond ; or that the parts muſt be broken, and worn off ; or both.

In the firſt caſe, the difficulty of raiſing one of the bodies makes that of the motion ; and of conſequence the friction ariſes wholly from the weight, or preſſion ; and the ſurface has nothing to do in it.

In the ſecond caſe, the magnitude of the ſurface would be all ; were it poſſible this ſecond caſe could be abſolutely abſtracted from the firſt, *i. e.* could the parts of one body be rubbed and worn againſt thoſe of the other, without raiſing one of them ; it being viſible, that a greater number of parts to be broken would make a greater reſiſtance than a leſs : but as in practice we never rub, or grind, without raiſing the body, the reſiſtance ariſing from the greatneſs of the ſurface in the ſecond caſe, is always combined with that from the preſſion ; whereas, in the former caſe, that ariſing from the preſſion may be alone and uncompounded.

Add, that what is worn off a body is ordinarily very little, with regard to the great number of times the body muſt have been raiſed during the friction, and all the little heights added together, which the body muſt have been raiſed to.

Hence, as the reſiſtance from preſſion may be ſingle ; and as the ſame always accompanies that ariſing from the magnitude of the ſurfaces, and is uſually much the more conſiderable of the two, when it does accompany it ; for theſe reaſons, in moſt of the experiments that are made, it is the only one perceived, and the only one that needs to be conſidered.

But then, as it is poſſible, in certain caſes, for the preſſion to be very ſlender, and the number of parts to be rubbed very great, it muſt be owned there are caſes wherein the friction follows, very ſenſibly, the proportion of the ſurfaces.

The ſubject of friction is of ſuch importance in its relation to the conſtruction and uſe of various machines, that we think it needleſs to make any apology for extending this article, ſo as to comprehend ſome more recent facts and obſervations, which may enable thoſe whom it more immediately concerns to form a juſt eſtimate of its quantity, and to obviate its effects. The ingenious Mr. Vince of Cambridge has lately directed his attention to this intereſting ſubject ; and communicated to the Royal Society an elaborate paper, containing a great number of experiments and of concluſions that are deduced from them, which merit particular notice. A minute detail would far exceed our limits ; and, therefore referring our readers to the 75th volume of the Philoſophical Tranſactions, we muſt content ourſelves with briefly ſtating the general reſult of the whole. Mr. Vince found, by deduction from his experiments, that the friction of hard bodies in motion is an uniformly retarding force ; and that the quantity of it is conſidered as *equivalent* to

to a weight drawing the body backwards on the horizontal plane, or acting contrary to the moving force, is equal to $M - \frac{M \times W \times S}{r t^2}$; where M is the moving force expressed by its weight, W the weight of the body upon the horizontal plane, S the space through which the moving force or weight descended in the time t expressed in seconds, and $r = 16\frac{1}{12}$ feet, the measure of the force of gravity. He also found that the quantity of friction increases in a less ratio than the quantity of matter or weight of the body; and that the friction of a body does not continue the same when it has different surfaces applied to the plane on which it moves, but that the smallest surfaces will have the least friction. To the experiments instituted by Mr. Ferguson and others, from which conclusions have been drawn so different from these, Mr. Vince makes the following objections; it was their object to determine what moving force would *just* put a body at rest in motion; and having, as they thought, found it, they thence concluded, that the accelerative force was then equal to the friction. But it is manifest, as Mr. Vince observes, that any force which will put a body in motion must be *greater* than the force which opposes its motion, otherwise it would not overcome it; and hence, if there were no other objection but this, it is evident that the friction could not be very accurately obtained. Besides, there is another objection which totally destroys the experiment so far as it tends to shew the quantity of friction, which is the strong cohesion of the body to the plane when it lies at rest; and this is confirmed by the following experiments: 1st, a body of $12\frac{3}{4}$ oz. was laid upon an horizontal plane, and then loaded with a weight of 8lb. and such a moving force was applied as would, when the body was *just put* in motion, continue that motion without any acceleration; in which case the friction must be just equal to the accelerative force. The body was then stopped, when it appeared that the same moving force which had *kept* the body in motion before, would not *put* it in motion, and it was found necessary to take off $4\frac{1}{2}$ oz. from the body before the same moving force *would put* it in motion: whence it appears that this body when laid upon the plane, at rest, acquired a very strong adhesion to it. 2dly. A body whose weight was 16 oz. was laid at rest upon the horizontal plane, and it was found that a moving force of 6 oz. would just *put* it in motion, but that a moving force of 4 oz. *would*, when it was just put in motion, *continue* that motion without any acceleration, and therefore the accelerative force must *then* have been equal to the friction, and not when the moving force of 6 oz. was applied. From these experiments it appears, how very considerable the cohesion was in proportion to the friction when the body was in motion: it being, in the latter case, almost one-third, and in the former it was found to be very nearly equal to the whole friction. All the conclusions, therefore, deduced from the experiments which have been instituted to determine the friction from the force necessary to *put* a body in motion, have manifestly been totally false; as such experiments only shew the resistance which arises from the cohesion and friction jointly.

After all these details we must recur to the experiments and reasoning of M. Coulomb for an accurate and satisfactory view of this complicated part of mechanical philosophy. His experiments were conducted on a large scale, with large bodies and heavy weights, so that he was thus enabled not only to correct the errors which unavoidably arose from the limited experiments of preceding writers, but to discover new phenomena, while he confirmed other conclusions, which had before been partially established. We shall here avail ourselves of the results of his experiments, as they are presented in an abridged form to the reader by Dr. Brewster in his edition of Ferguson's Mechanics, vol. ii. and refer for a fuller account to the "Journal de Physique" for Sept. and Oct. 1785, vol. xxvii. p. 206—282, &c.

1. The friction of homogeneous bodies, or bodies of the same kind moving upon one another, is generally supposed to be greater than that of heterogeneous bodies. This was the opinion of Muschenbroek, Krafft, Camus, and Bossut. But Coulomb has shewn that there are exceptions to this rule. He found, for example, that the friction of oak upon oak was equal to $\frac{1}{2\cdot 34}$ of the force of pression; the friction of pine against pine was $\frac{1}{1\cdot 78}$, and of oak against pine $\frac{1}{1\cdot 5}$. The friction of oak against copper was $\frac{1}{5\cdot 5}$, and that of oak against iron nearly the same.

2. It was generally supposed, that in the case of wood, the friction is greatest when the bodies are dragged contrary to the course of their fibres. Muschenbroek, Introductio ad Philosoph. Nat. § 513, Bc. But Coulomb has shewn that the friction is in this case sometimes the smallest. When the bodies moved in the direction of their fibres the friction was $\frac{1}{2\cdot 34}$ of the fibres with which they were pressed together; but when the motion was contrary to the course of the fibres, the friction was only $\frac{1}{3\cdot 76}$.

3. The longer the rubbing surfaces remain in contact, the greater is their friction. This is mentioned by Bossut, Traite de Mecanique, § 310; but Coulomb has the merit of having established the fact.—When wood was moved upon wood, according to the direction of the fibres, the friction was increased by keeping the surfaces in contact for a few seconds; and when the time was prolonged to a minute, the friction seemed to have reached its farthest limit. But when the motion was performed contrary to the course of the fibres, a greater time was necessary before the friction arrived at its maximum. When wood was moved upon metal, the friction did not attain its maximum till the surfaces continued in contact for five or six days; and it is very remarkable, that when wooden surfaces were anointed with tallow, the time requisite for producing the greatest quantity of friction is increased. The increase of friction which is generated by prolonging the time of contact is so great, that a body weighing 1650 pounds was moved with a force of 64 pounds when first laid upon its corresponding surface. After having remained in contact for the space of three seconds, it required 160 pounds to put it in motion, and when the time was prolonged to six days, it could scarcely be moved with a force of 622 pounds. When the surfaces of metallic bodies were moved upon one another, the time of producing a maximum of friction was not changed by the interposition of olive oil; it was increased, however, by employing swines grease as an unguent, and was prolonged to five or six days by besmearing the surfaces with tallow.

4. Friction is in general proportional to the force with which the rubbing surfaces are pressed together; and is, for the most part, equal to between $\frac{1}{3}$ and $\frac{1}{4}$ of that force.—In order to prove the first part of this proposition, Coulomb employed a large piece of wood, whose surface contained three square feet, and loaded it successively with 74 pounds, 874 pounds, and 2474 pounds. In these cases the friction was successively $\frac{1}{2.46}$, $\frac{1}{2.16}$, $\frac{1}{2.21}$ of the force of

pression;

preffion; and when a lefs furface and other weights were ufed, the friction was $\frac{1}{2.36}$, $\frac{1}{2.42}$, $\frac{1}{2.40}$. Similar refults were obtained in all Coulomb's experiments, even when metallic furfaces were employed. The fecond part of the propofition has alfo been eftablifhed by Coulomb. He found that the greateft friction is engendered when oak moves upon pine, and that it amounts to $\frac{1}{1.78}$ of the force of preffion; on the contrary, when iron moves upon brafs, the leaft friction is produced, and it amounts to $\frac{1}{4}$ of the force of preffion.

5. Friction is in general not increafed by augmenting the rubbing furfaces. Mufchenbroek and Nollet entertained the oppofite opinion. The experiments of Krafft coincide with thofe of Coulomb. See Commentarii Petropolitanæ, tom. xii. p. 266, § 19, 20, &c.—When a fuperficies of three feet fquare was employed, the friction, with different weights, was $\frac{1}{2.28}$ at a medium; but when a fmaller furface was ufed, the friction, inftead of being greater, as might have been expected, was only $\frac{1}{2.39}$.

6. Friction for the moft part is not augmented by an increafe of velocity. In fome cafes, however, it is diminifhed by an augmentation of celerity.—M. Coulomb found, that when wood moved upon wood in the direction of the fibres, the friction was a conftant quantity, however much the velocity was varied; but that when the furfaces were very fmall in refpect to the force with which they were preffed, *the friction was diminifhed by augmenting the rapidity*: the friction, on the contrary, was increafed when the furfaces were very large when compared with the force of preffion. When the wood was moved contrary to the direction of its fibres, the friction in every cafe remained the fame. If wood is moved upon metals, the friction is greatly increafed by an increafe of velocity; and when metals move upon wood befmeared with tallow, the friction is ftill augmented by adding to the velocity. When metals move upon metals, the friction is always a conftant quantity; but when heterogeneous fubftances are employed which are not bedaubed with tallow, the friction is fo increafed with the velocity, as to form an arithmetical progreffion when the velocities form a geometrical one.

7. The friction of loaded cylinders rolling upon a horizontal plane is in the direct ratio of their weights, and the inverfe ratio of their diameters. In Coulomb's experiments, the friction of cylinders of guaiacum wood, which were two inches in diameter, and were loaded with 1000 pounds, was 18 pounds or $\frac{1}{56}$ of the force of preffion. In cylinders of elm, the friction was greater by $\frac{2}{5}$, and was fcarcely diminifhed by the interpofition of tallow.

From a variety of experiments on the friction of the axes of pullies, Coulomb obtained the following refults.—When an iron axle moved in a brafs bufh or bed, the friction was $\frac{1}{6}$ of the preffion; but when the bufh was befmeared with very clean tallow, the friction was only $\frac{1}{11}$, when fwine's greafe was interpofed, the friction amounted to $\frac{1}{8.5}$, and when olive oil was employed as an unguent, the friction was never lefs than $\frac{1}{8}$ or $\frac{1}{7.5}$. When the axis was of green oak, and the bufh of guaiacum wood, the friction was $\frac{1}{26}$ when tallow was interpofed; but when the tallow was removed fo that a fmall quantity of greafe only covered the furface, the friction was increafed to $\frac{1}{17}$. When the bufh was made of elm, the friction was in fimilar circumftances $\frac{1}{33}$ and $\frac{1}{20}$ which is the leaft of all. If the axis be made of box, and the bufh of guaiacum wood, the friction was $\frac{1}{23}$ and $\frac{1}{14}$, circumftances being the fame as before. If the axle be of boxwood, and the bufh of elm, the friction will be $\frac{1}{29}$ and $\frac{1}{20}$; and if the axle be of iron and the bufh of elm, the friction will be $\frac{1}{20}$ of the force of preffion.

The caufe of friction is well illuftrated by Mr. John Leflie, profeffor of mathematics in the univerfity of Edinburgh. (See his valuable work on the nature and propagation of heat, chap. xv. p. 299, &c.) "If the two furfaces," fays this ingenious writer, "which rub againft each other are rough and uneven, there is a neceffary wafte of force, occafioned by the grinding and abrafion of their prominences. But friction fubfifts after the contiguous furfaces are worked down as regular and fmooth as poffible. In fact, the moft elaborate polifh can operate no other change than to diminifh the fize of the natural afperities. The furface of a body, being moulded by its internal ftructure, muft evidently be furrowed, or toothed, or ferrated. Friction is, therefore, commonly explained on the principle of the inclined plane, from the effort required to make the incumbent weight mount over a fucceffion of eminences. But this explication, however currently repeated, is quite infufficient. The mafs which is drawn along is not continually afcending; it muft alternately rife and fall: for each fuperficial prominence will have a correfponding cavity; and fince the boundary of contact is fuppofed to be horizontal, the total elevations will be equalled by their collateral depreffions. Confequently, if the lateral force might fuffer a perpetual diminution in lifting up the weight, it would, the next moment, receive an equal increafe by letting it down again; and thofe oppofite effects, deftroying each other, could have no influence whatever on the general motion.

"Adhefion feems ftill lefs capable of accounting for the origin of friction. A perpendicular force acting on a folid can evidently have no effect to impede its progrefs; and though this lateral force, owing to the unavoidable inequalities of contact, may be fubject to a certain irregular obliquity, the balance of chances muft, on the whole, have the fame tendency to accelerate, as to retard, the motion. If the conterminous furfaces were, therefore, to remain abfolutely paffive, no friction could ever arife. Its exiftence demonftrates an unceafing mutual change of figure, the oppofite planes, during the paffage, continually feeking to accommodate themfelves to all the minute and accidental varieties of contact. The one furface, being preffed againft the other, becomes, as it were, compactly indented, by protruding fome points and retracting others. This adaptation is not accomplifhed inftantaneoufly, but requires very different periods to attain its *maximum*, according to the nature and relation of the fubftances concerned. In fome cafes a few feconds are fufficient, in others, the full effect is not produced till after the lapfe of feveral days. While the incumbent mafs is drawn along, at every ftage of its advance, it changes its external configuration, and approaches more or lefs towards a ftrict contiguity with the under furface. Hence the effort required to put it firft in motion, and hence too, the decreafed meafure of friction, which, if not deranged by adventitious caufes, attends generally an augmented rapidity. This appears clearly eftablifhed by the curious experiments of Coulomb, the moft original and valuable which have been made on that interefting fubject. Friction confifts in the force expended to raife continually the furface of preffure by an oblique action. The upper furface travels over a perpetual fyftem of inclined planes; but

but that fyftem is ever changing, with alternate inverfion. In this act, the incumbent weight makes inceffant, yet unavailing efforts to afcend: for the moment it has gained the fummits of the fuperficial prominences, thefe fink down beneath it, and the adjoining cavities ftart up into elevations, prefenting a new feries of obftacles which are again to be furmounted; and thus the labours of Sifiphus are realized in the phenomena of friction.

"The degree of friction muft evidently depend on the angles of the natural protuberances, and which are determined by the elementary ftructure or the mutual relation of the two approximate fubftances. The effect of polifhing is only to abridge thofe afperities and increafe their number, without altering in any refpect their curvature or inflexions. The conftant or fucceffive acclivity produced by the ever-varying adaptation of the contiguous furfaces remains, therefore, the fame, and confequently the expenfe of force will ftill amount to the fame proportion of the preffure. The intervention of a coat of oil, foap, or tallow, by readily accommodating itfelf to the variations of contact, muft tend to equalize it, and therefore muft leffen the angles, or foften the contour, of the fucceffively emerging prominences, and thus diminifh likewife the friction which thence refults."

In order to diminifh the refiftance which friction occafions in machines, that fpecies of friction which arifes from one body being dragged over another has been converted into that which is occafioned by one body rolling upon another. This may be eafily effected in the manner already mentioned in the beginning of this article, by applying wheels or rollers to the fockets or bufhes which fuftain the gudgeons of large wheels, and the axles of wheel-carriages. This apparatus feems to have been firft recommended by Cafatus (Mechan. l. ii. cap. 1.); and it was afterwards mentioned by Sturmius (Mifcell. Berol. tom. i. p. 306.) and Wolfius (Op. Mathem. tom. ii. p. 680.); but it was not ufed in practice till Sully applied it to clocks in the year 1716, and Mondran to cranes in 1725. However, friction-wheels were not much regarded till the celebrated Euler accurately explained their nature and advantages. (See Mém. de l'Acad. de Berlin 1743.)

The diameter of the gudgeons and pivots fhould be made as fmall as the weight of the wheel and the impelling force will permit. The gudgeons fhould reft upon two wheels as large as circumftances will allow, having their axes as near each other as poffible, but no thicker than what is abfolutely neceffary to fuftain the fuperincumbent weight. When thefe precautions are properly attended to, the refiftance which arifes from the friction of the gudgeons, &c. will be extremely trifling. The effects of friction may likewife in fome meafure be removed by a judicious application of the impelling power, and by proportioning the fize of the friction-wheels to the preffure which they feverally fuftain. If we fuppofe, for example, that the weight of a wheel, whofe iron gudgeons move in bufhes of brafs, is 100 pounds; then the friction arifing from both its gudgeons will be equivalent to 25 pounds. If we fuppofe alfo that a force equal to 40 pounds is employed to impel the wheel, and acts in the direction of gravity, as in the cafe of overfhot wheels, the preffure of the gudgeons upon their fupports will thus be 140 pounds and the friction 35 pounds. But if the force of 40 pounds could be applied in fuch a manner as to act in direct oppofition to the wheel's weight, the preffure of the gudgeons upon their fupports would be 100—40, or 60 pounds, and the friction only 15 pounds. It is impoffible indeed to make the moving force act in direct oppofition to the gravity of the wheel, in the cafe of water-mills; and it is often impracticable for the engineer to apply the impelling power but in a given way; but there are many cafes in which the moving force may be fo exerted, as at leaft not to increafe the friction which arifes from the wheel's weight.

When the moving force is not exerted in a perpendicular direction, but obliquely, as in underfhot wheels, the gudgeon will prefs with greater force on one part of the focket than on any other part. This point will evidently be on the fide of the bufh oppofite to that where the power is applied, and its diftance from the loweft point of the focket, which is fuppofed circular and concentric with the gudgeon, being called x, we fhall have tang. $x = \frac{H}{V}$, that is, the tangent of the arc contained between the point of greateft preffure and the loweft point of the bufh, is equal to the fum of all the horizontal forces, divided by the fum of all the vertical forces and the weight of the wheel, H reprefenting the former, and V the latter quantities. The point of greateft preffure being thus determined, the gudgeon muft be fupported at that part by the largeft friction-wheel, in order to equalize the friction upon their axles.

In the two following cafes friction-wheels have been fuccefsfully employed. Mr. Gottlieb, the conftructor of a new crane, has received a patent for what he calls an anti-attrition axle-tree, the beneficial effects of which he has afcertained by a variety of trials. It confifts of a fteel roller about four or fix inches long, which turns within a groove cut in the inferior part of the axle. When wheel-carriages are at reft, Mr. Gottlieb has given the friction-wheel its proper pofition; but it is evident that the point of greateft preffure will change when they are put in motion, and will be nearer the front of the carriage. This point, however, will vary with the weight of the load; but it is fufficiently obvious that the friction-roller fhould be at a little diftance from the loweft point of the axle-tree.

Mr. Gamett of Briftol has applied friction-rollers in a different manner, which does not, like the preceding method, weaken the axle-tree. Inftead of fixing the rollers in the iron part of the axle, he leaves a fpace between the nave and the axis to be filled with equal rollers almoft touching each other. The axes of thefe rollers are inferted in a circular ring at each end of the nave, and thefe rings, and confequently the rollers, are kept feparate and parallel by means of fmall bolts paffing between the rollers from one fide of the nave to the other.

In wheel-carriages conftructed in the common manner, with conical rims, there is a great degree of refiftance occafioned by the friction of the linch pins on the external part of the nave, which the ingenious mechanic may eafily remove by a judicious application of the preceding principles.

As it appears from the experiments of Fergufon and Coulomb, that the leaft friction is generated when polifhed iron moves upon brafs, the gudgeons and pivots of wheels, and the axles of friction-rollers, fhould all be made of polifhed iron, and the bufhes in which thefe gudgeons move, and the friction-wheels, fhould be formed of polifhed brafs. M. de la Hire recommends the fockets or bufhes to be made fquare and not concave.

When every mechanical contrivance has been adopted for diminifhing the obftruction which arifes from the attrition of the communicating parts, it may be ftill farther removed by the judicious application of unguents. The moft proper for this purpofe are fwine's greafe and tallow, when the furfaces are made of wood, and oil when they are of metal. When the force with which the furfaces are preffed together is very great, tallow will diminifh the friction more than fwine's greafe. When the wooden furfaces are very fmall, unguents will leffen their friction a little, but it will be greatly

greatly diminifhed if wood moves upon metal greafed with tallow. If the velocities, however, are increafed, or the unguent not often enough renewed, in both thefe cafes, but particularly in the laft, the unguent will be more injurious than ufeful. The beft mode of applying it, is to cover the rubbing furfaces with as thin a ftratum as poffible, for the friction will then be a conftant quantity, and will not be increafed by an augmentation of velocity.

In fmall works of wood, the interpofition of the powder of black lead has been found very ufeful in relieving the motion. The ropes of pulleys fhould be rubbed with tallow, and whenever the fcrew is ufed, the fquare threads fhould be preferred. (Fergufon's Lectures by Brewfter, vol. ii.)

FRICTION-*wheels*. See the preceding article and WHEELS.

FRICTION *of the parts of Fluids*. See RESISTANCE and RETARDATION *of fluids*.

FRICTION *of Ropes*. See CORDAGE and ROPES.

FRICTION *of Wheel-carriages*. See WHEEL-*carriages*.

FRICTION, in *Medicine* and *Surgery*, the act of rubbing the furface of the body, whether with the hand only, with the flefh-brufh, flannel, or other fubftances, or with oils, ointments, or other medicinal matters, with a view to the prefervation of health, or to the removal of particular difeafes.

Friction appears to have been much employed by the ancients as a fort of gentle exercife for the purpofe of preferving the health and ftrength of the body; and many directions have been left us by the phyficians with refpect to the times and modes of employing it, adapted to particular circumftances. But, on the whole, thefe directions appear to be fanciful, and of little practical utility. (See Oribafius, Medicin. Collect. lib. vi. cap. 13. 16—20.) Friction is confidered by this author as chiefly efficacious in removing languor and laffitude, and ftrengthening the digeftive powers, and the animal folids in general. It is recommended to be employed previous to any active exercife, with a view of foftening the mufcular parts and the fkin, that they may not be ruptured or torn during the exertions (loc. cit. cap. 13, de frictione præparante); and again at the conclufion of active exercife, in order to remove the fenfations of laffitude, and to purge off all excrementitious matters. (Loc. cit. cap. 16. de apotherapia frictione.) We are told likewife that by hard rubbing the body is rendered firm; by gentle friction it is foftened; by frequent and long continued friction it is extenuated; and by a moderate degree the bulk is encreafed. (Cap. 17.)

It cannot be queftioned, that friction on the furface of the body produces an effect fimilar to that of gentle exercife: it tends to excite the circulation through the veffels of the fkin, and confequently through the reft of the vafcular fyftem; whence all the functions are more perfectly performed; the fecretions are more freely elaborated; the appetite, therefore, is augmented; the digeftion more completely effected, and the excretions, efpecially that of perfpiration, more perfectly thrown off. (See EXERCISE.) In delicate habits the ufe of the flefh-brufh, or gentle rubbing with the hand, until fome degree of glow is produced on the furface, may contribute, therefore, like riding or other fpecies of geftation, to fupport or improve the health. The wholefome effects of friction are well illuftrated by the advantages of currying horfes: the benefits derived from it in thefe animals are generally confidered as equivalent to half the feeding.

In this country, however, the principal employment of friction is directed to the cure rather than to the prevention of difeafes; and is generally accompanied by the ufe of fome fpecies of medicated oil, ointment, or lotion. Thefe auxiliaries are fometimes poffeffed of medicinal qualities, which add to the efficacy of the friction; fuch as the volatile or other ftimulating liniments by which the vafcular action of the part affected is more fpeedily excited; but frequently they are of no effential fervice, and are prefcribed partly to facilitate the procefs of rubbing, by lubricating the parts; and partly to induce the patient and his attendants to perfevere in the practice of friction, who are too apt to fuppofe that the friction itfelf is ufelefs, and to attribute the remedial effects to the lotion or liniment employed.

Friction is an efficacious remedy in feveral conditions of difeafe; particularly in chronic rheumatifms of long ftanding; in mufcular contractions, fucceeding to rheumatifm, &c. and connected often with effufions of lymph; in fome ftates of paralyfis; in certain indolent tumours, &c. In thefe cafes, a variety of unguents and liniments is recommended; but the friction itfelf is the principal fource of relief. In this manner a refpectable practitioner in Oxfordfhire, Mr. Grofvenor, is faid to fucceed in removing a number of difeafes, of the nature of thofe juft mentioned, by means of long continued friction with the hand alone: and an empiric of the name of Greatrakes, or Greatrix, formerly effected fome cures that were deemed marvellous by this method of manual friction, which he called *ftroaking*. (See Phil. Tranf. No. 256.)

Friction is likewife employed with the view of introducing certain medicinal fubftances into the fyftem, through the medium of the abforbent veffels of the fkin. Through thefe veffels, which open upon the fkin, but under the cuticle, the animal economy may be influenced by the peculiar properties of medicines; but friction is required to impel them through the inorganic pores of the fcarf-fkin, without which they are not abforbed. In this way practitioners have been for a long time in the habit of employing one of the moft active agents in the materia medica, *viz. mercury*, for the cure of the venereal difeafe. The advantages of this mode of impregnating the fyftem with mercury are very great in fome conftitutions; efpecially in thofe in which the fmalleft portion of mercury, conveyed into the inteftines, acts as a purgative, and therefore cannot be thrown into the fyftem in fufficient quantity to eradicate the difeafe, or without producing exceffive mifchief by its cathartic operation. When the medicine is conveyed into the circulation, by means of the cutaneous abforbents, this effect upon the alimentary canal is avoided.

Another active and ufeful drug has alfo been advantageoufly conveyed into the fyftem by means of external friction; we mean *opium*. The attention of the profeffion has been lately called to this mode of adminiftering opium by Mr. Ward of Manchefter; from whofe experience, fupported by that of the late Dr. Percival of the fame place, it appears, that the principal untoward confequences which occafionally refult from the internal adminiftration of this narcotic drug, in particular conftitutions, and in certain ftates of difeafe, efpecially its difagreeable effects on the head and the ftomach, are avoided by introducing it through the abforbents of the fkin. In fome cafes, too, as in that of locked jaw, whether from tetanus or hyfteria, when the mouth is fo firmly clofed, that nothing can be made to pafs to the throat, the external friction with opium is the only practicable mode of adminiftering this important remedy. Dr. Percival found that opium, thus ufed, gave relief to patients afflicted with fome chronic and painful diforders, without occafioning the head-ache, giddinefs, and coftivenefs which the internal ufe of laudanum had previoufly produced. In feveral cafes of the delirium of typhous fever, and of mania, opium thus employed was very efficacious. It was fuppofed by fome Italian phyficians, who firft reforted to the ufe of opium by

 external

external friction, that a mixture with fome animal fluid, fuch as the faliva or gaftric juice, was requifite for the abforption of the drug. (See Duncan's Annals of Medicine for 1798.) But Mr. Ward found that the tincture of opium alone, or formed into a liniment by means of the yolk of eggs, &c. was well adapted for abforption ; and that from three to fix drachms of the tincture of opium, according to the age of the patient and the feverity of the difeafe, may be rubbed upon the infides of the arms, until the whole is abforbed. Sometimes he ufed an ointment, confifting of one part of finely powdered opium, with four or five parts of hogs' lard, and one or two of olive oil; and he obferved, that the fmaller the quantity of unguent the better, provided the whole be made fo fmooth and foft, as not to occafion any uneafinefs by its tenacity in applying the neceffary degree of friction. (See Ward on the Efficay of Opiate Friction in Spafmodic and Febrile Difeafes, 1809.)

FRIDAU, in *Geography*, a town of Auftria; 4 miles S. of St. Polten.

FRIDAW, a town of the duchy of Stiria; 104 miles S. of Vienna. N. lat. 46° 27'. E. long. 16° 10'.

FRIDAY, the fixth day of the week, fo called from Friga, a goddefs worfhipped by the Saxons on this day. It is a faft-day in the church of England, in memory of our Saviour's crucifixion, unlefs Chriftmas-day happens to fall on Friday, which is always a feftival.

FRIDAY, *Good*, See PASSION-*Week*.

FRIDBERG, in *Geography*, a town of the duchy of Stiria; 43 miles S. of Vienna. N. lat. 47° 27'. E. long. 15° 53'.—Alfo, a town of Bavaria; 4 miles S. E. of Augfburg. N. lat. 48° 17'. E. long. 10° 58'.—Alfo, a town of Germany, in the Wetheraw, on the Erbach; formerly an Imperial town, till, in 1802, it was given to the landgrave of Heffe-Darmftadt; 12 miles N. of Frankfort on the Mayn. N. lat. 52° 20'. E. long. 8° 41'.

FRIDEK, or FRIEDEK, a town and lordfhip of Silefia, in the principality of Tefchen; 10 miles S. W. of Tefchen. N. lat. 49° 52'. E. long. 18° 28'.

FRIDERICKSBERG, a fort and fettlement on the coaft of Guinea; 70 miles from Cape Coaft caftle.

FRIDEWALDE, a town of Germany, in the county of Sayn, a fief of Heffe-Darmftadt; 9 miles S. of Siegen.—Alfo, a town of Germany, in the principality of Heffe-Caffel; 35 miles S. S. E. of Caffel.

FRIDINGEN, a town of Auftrian Swabia, on the Danube; 20 miles S. E. of Tubingen.

FRIDLAND, or FRIEDLAND, a town of Pruffia, in the province of Natangen, on the left bank of the Alle; 28 miles S. E. of Konigfberg. N. lat. 54° 24'. E. long. 21° 10'.

FRIDMAN, a town of Hungary; 17 miles N. N. W. of Palotza.

FRIDO, a town of Naples, in the Bafilicata; 7 miles E.S.E. of Potenza.

FRIDSTOLL, or FRITHSTOW, of the Saxon *frid*, peace, and *ftol*, feat, in our *Ancient Writers*, fignifies a feat, chair, or place of peace, where criminals might find fafety and protection.

In the charter of immunities confirmed to the church of St. Peter in York, Ann. 5 H. VII. it is explained by "Cathedra quietudinis & pacis."

Of thefe there were many in England: but the moft famous was at Beverley, which had this infcription, "Hæc fedes lapidea *Freedftol* dicitur, *i. e.* Pacis Cathedra ad quam reus fugiendo perveniens, omnimodam habet fecuritatem." Camden.

FRIEDBERG, in *Geography*, a town of Silefia, in the principality of Neiffe, on the Neiffe; 14 miles S.S.W. of Neiffe. N. lat. 50° 5'. E. long. 16° 15'.—Alfo, a town of Silefia, in the principality of Jauer, on the Queis; 30 miles W. of Jauer. N. lat. 50° 52'. E. long. 15 27'.—Alfo, a town of Silefia, in the principality of Schweidnitz; 10 miles N.W. of Schweidnitz.—Alfo, a Moravian fettlement in America, fituated in Wachovia, or Surry county, N. Carolina.

FRIEDEBERG, a town of Germany, in the New Mark of Brandenburg; 45 miles N.E. of Francfort on the Oder. N. lat. 52° 56'. E. long. 15° 40'.—Alfo, a town of Eaft Friefland; 22 miles E.N.E. of Emden. N. lat. 53° 36'. E. long. 7° 48'.

FRIEDELAND, or BRILAN, a town of Lower Lufatia, on the Spree; 12 miles N.W. of Guben. N. lat. 52° 7'. E. long. 14° 12'.

FRIEDELSHAUSEN, a town of Germany, in the county of Henneberg; 7 miles N.W. of Meinungen.

FRIEDENSHUTTEN, a Moravian fettlement in America, whofe name fignifies "tents of peace," feated on Sufquehanna river in Pennfylvania, about 24 miles below Tioga point, eftablifhed in 1765.

FRIEDERICK'S FIORD, a bay of Weft Greenland. N. lat. 62° 12'. W. long. 48° 20'.

FRIEDERICKSTADT, a town on the W. coaft of the ifland of Santa Cruz. N. lat. 17° 48'. W. long. 93° 25'.

FRIEDLAND, a town of Silefia, in the principality of Schweidnitz; 16 miles S.W. of Schweidnitz. N. lat. 50° 27'. E. long. 16° 3'.—Alfo, a Moravian fettlement of America, in Wachovia.

FRIEDLAND, a town of Moravia, in the circle of Olmutz; 18 miles N.N.E. of Olmutz.—Alfo, a town of Bohemia, in the circle of Boleflaw; 9 miles N.E. of Krottau.—Alfo, a town of the duchy of Mecklenburg; 14 miles N.E. of New Brandenburg. N. lat. 53° 39'. E. long. 13° 30'.—Alfo, a town of Silefia, in the principality of Oppeln, on the Steinau; 20 miles S.W. of Oppeln. N. lat. 50° 25'. E. long. 17° 30.

FRIEDLINGEN, or FRIDLINGEN, a town and fort of Germany, in the circle of Swabia, near the Rhine, between Huningue and Bâle.

FRIELED, a town of Sweden, in the province of Smaland; 33 miles N.W. of Wexio.

FRIENDLESS MAN, was the old Saxon name for him whom we call an outlaw.

The reafon is, becaufe he was, upon his exclufion from the king's peace and protection, denied all help of friends, after certain days. "Nam foris fecit amicos."

FRIENDLY COVE, in *Geography*, a harbour in Nootka found, on the N.W. coaft of America, where a fettlement was formed, in 1788, by Mr. Meares, and fome other Englifhmen, for the purpofe of carrying on the fur trade. As this fettlement occafioned a ferious difpute between Spain and England, and very nearly terminated in a war between the two countries; we fhall here ftate fome particulars relating to it, as they were communicated to us both by Capt. Vancouver, in the year 1792, and by Mr. Duffin, fupercargo on board one of Mr. Meares's veffels. Towards the clofe of the year 1787, two veffels were equipped for the fur trade, by John Henry Cox and Company, merchants at Canton. The conduct of the expedition was committed to Mr. Meares, who was alfo a joint proprietor. Thefe veffels failed, with a view of avoiding certain heavy dues, under Portuguefe colours, and under the firm of John Cavallo, efq., a Portuguefe merchant at Macao; but the veffels and their cargoes were wholly Britifh property, and navigated by fubjects of his Britannic majefty. In May 1788, Mr. Meares

Meares arrived in one of these vessels at Nootka, and going on shore he purchased of the two chiefs, Maquilla and Calicum, the whole of the land that forms Friendly Cove, Nootka found, in his Britannic majesty's name, for eight or ten sheets of copper, and some trifling articles. The natives were perfectly satisfied, and did homage to Mr. Meares, as their sovereign, according to the custom of their country; the British, and not the Portuguese, flags being displayed on shore during these solemn transactions. In consequence of this compact, Mr. Meares selected a convenient spot on which he erected a house and adjoining buildings, and at his departure committed the care of it to Maquilla till his return. Mr. Duffin, on his return in July 1789, found the Cove occupied by the subjects of his Catholic majesty, and could perceive no vestiges of Mr. Meares's house. On the spot where it had stood were tents and houses belonging to some people of the Columbia, commanded by Mr. J. Kendrick, under the flag and protection of the United States of America; his Catholic majesty's ships, Princessa and San Carlos were at anchor in Friendly Cove, together with the Columbia and Washington, American traders: on the second day after their arrival they were captured by Don Martinez; and the Americans were suffered to carry on their commerce with the natives, without molestation. Such is the substance of Mr. Duffin's declaration, attested by oath. In 1791 captain Vancouver was sent out by the court of Great Britain to take possession of Nootka found, according to an agreement with the court of Spain, and he arrived at Friendly Cove in August 1792. Signor Quadra, the commander of Nootka found, was willing to surrender Friendly Cove, but not the whole of the settlement, thus imagining verbally to fulfil the agreement between the two crowns. Vancouver demurred and would not allow, that the cession proposed by Signor Quadra was that intended in his commission; but that at least the whole port of Nootka, of which his Majesty's subjects had been forcibly dispossessed, and at which they themselves, their vessels, and cargoes, had been captured, must have been the proposed object of restitution. Under these impressions Vancouver declined acceding to the proposals of Quadra, conceiving that if he did he should betray the trust with which he was honoured. He was afterwards confirmed in the opinion, that he thus pursued the conduct, which, however it might terminate, was not incompatible with the trust committed to his charge and execution. N. lat. 49° 35′. E. long. 233° 30′. See NOOTKA *Sound.*

FRIENDLY *Islands*, a group of islands, forming a kind of Archipelago of very considerable extent, and consisting of more than 150 in number; situated in the Southern Pacific Ocean, between 19° 40′ and 21° 30′ S. lat. and between 184° 46′ and 185° 45′ E. long. Some of these islands were discovered by Tasman in January 1642—3; and two of them in particular were called by him Amsterdam and Middleburg; but the former is called by the natives Tongatabu, and the latter Ea-oo-wee. These two islands are situated between the latitude of 21° 29′ and 21° 3′ S. and between the longitude of 174° 40′ and 175° 15′ W. They were visited by captain Cook, in April 1773, and again in October 1777. (See AMSTERDAM and MIDDLEBURG.)

To this cluster of islands Cook gave the name of the Friendly Islands, or Archipelago, from the firm alliance and friendship which seemed to subsist among their inhabitants, and from their courteous behaviour to strangers. The stay which captain Cook made at the Friendly Islands on his second visit was between two and three months; during which time, some accidental differences excepted, the utmost cordiality subsisted between the English and the natives. These differences were never attended with any fatal consequences; which happy circumstance was principally owing to the unremitting attention of the captain, who directed all his measures with a view to the prevention of such quarrels as would be injurious either to the inhabitants or to his own people. Whilst our navigators continued at these islands, they expended very little of their sea provisions, subsisting, in general, upon the produce of the country, and carrying away with them a quantity of refreshments sufficient to last till their arrival at another station, where they could depend upon a fresh supply. The captain left with these hospitable Indians several animals that would be useful to them. Many advantages obviously resulted from this visit; besides the immediate benefits which both the natives and the English derived from their mutual intercourse, such a large accession was made to the geographical knowledge of this part of the Pacific ocean, as cannot fail to be of service to future navigators.

Under the denomination of the Friendly Islands must be included not only the group at *Hapaee* (which see), but all those islands that have been discovered nearly under the same meridian to the North, as well as some others, which, though they have never hitherto been seen by any European voyagers, are under the dominion of Tongataboo. From the information received by captain Cook, this Archipelago appears to be very extensive; above 150 islands were reckoned up by the natives, who made use of bits of leaves to ascertain their number; and Mr. Anderson, with his usual diligence, procured all their names. Fifteen of them are said to be high or hilly, such as Toofoa and Eooa; and 35 of them large. Concerning the size of the 32 which were unexplored, we can only state, that they must be larger than Annamoka, which was reckoned among the smaller isles. Several, indeed, of those which belong to this latter denomination are mere spots without inhabitants. Sixty-one of these isles have their proper places and names marked upon the chart of the Friendly Islands, and the sketches of the harbour of Tongataboo, which are given in Cook's Third Voyage, (vol. iii.) captain Cook had not the least doubt but that Prince William's Islands, discovered or named by Tasman, were comprehended in the list furnished by the natives. He had also good authority for believing, that Keppel's and Boscawen's Islands, two of captain Wallis's discoveries in 1765, were included in the same list; and that they were under the sovereignty of Tongataboo, which is the grand seat of government. It must be left to future navigators to extend the geography of this part of the South Pacific ocean, by ascertaining the exact situation and size of nearly 100 islands in the neighbourhood, which captain Cook had no opportunity of exploring. The soil in these islands is fertile, and in some of them highly cultivated, which, considering the imperfection of the agricultural implements, must have been attended with great labour. This labour, however, is amply rewarded by great produce. No one wants the common necessaries of life; in every face are painted joy and contentment. An easy freedom prevails among all ranks of people: they feel no wants which they do not enjoy the means of supplying; and they live in a clime, where the painful extremes of heat and cold are equally unknown. If nature has been in any respect deficient in its bounty, it is in the article of fresh water, which, being shut up in the bowels of the earth, must be procured by digging. A running stream was not seen, and but one well, at Amsterdam. At Middleburg, no water was seen besides that which the natives had in vessels; but this was sweet and cool. The government of these islands

feems to be monarchical, refembling that of Otaheite. The king, or great chief, who is here called Areeke, has other chiefs under him, who are lords of certain diftricts, and perhaps fole proprietors, to whom the people appear to pay great refpect and obedience. There is alfo a third rank, which has no fmall degree of authority over the common people. Captain Cook thinks that all the land in Tongataboo is private property, and that there is here, as well as at Otaheite, a clafs of perfons who are fervants or flaves, and who have no property in land. Their domeftic animals are hogs and fowls; but they feem to have no dogs nor cats, nor any other wild quadrupeds, except fmall lizards. The land birds are pigeons, turtle-doves, parrots, parroquets, owls, bald coots with a blue plumage, a variety of fmall birds, and large bats in abundance. Their forts of fifh feem to be the fame with thofe of the other ifles. Their fifhing inftruments are the fame: that is, hooks made of mother of pearl, gigs with two, three, or more prongs, and nets made of a very fine thread, with the mefhes wrought exactly like ours. But their ingenuity is fingularly confpicuous in the conftruction or form of their canoes, which exceeded every thing of the kind which captain Cook and his companions faw in that fea. They are admirably adapted for diftant navigation, as well as for the purpofe of being veffels of burden. Their working tools are made of ftone, bone, fhells, &c. as they are at the other iflands; and their ingenious application of thefe tools excited admiration. Their knowledge of the utility of iron was barely fufficient to teach them to prefer nails to beads, and fuch trifles; fome, but very few, would exchange a pig for a large nail, or a hatchet. Old jackets, fhirts, cloth, and even rags, were in higher eftimation among them than the beft edged tool. The only piece of iron obferved among them was a fmall broad awl, which had been made of a nail.

The beft articles for traffick, at thefe iflands, are iron tools in general. Axes and hatchets; nails, from the largeft fpike down to tenpenny ones; rafps; files; and knives, are much fought after. Sail cloth, and linen, both white and coloured, looking-glaffes and beads, are alfo in eftimation; but of the latter, thofe that are blue are preferred to all others; as white ones are the leaft valuable. A ftring of large blue beads would, at any time, purchafe a hog. In return for thefe favourite commodities, all the refrefhments may be procured which the iflands produce. Thefe are hogs, fowls, fifh, yams, bread-fruit, plantains, cocoa-nuts, fugar-cane, and, in general, every fuch article as can be met with at Otaheite, or any one of the Society Iflands. The yams are excellent, and when grown to perfection, will keep well at fea: but their pork, bread-fruit, and plantains are inferior in quality to thofe of Otaheite, or its neighbourhood. Good water, as we have already obferved, is fcarce in thefe iflands. The natives of the Friendly Iflands feldom exceed the common ftature, though fome were above fix feet; but they are very ftrong, and well made, efpecially as to their limbs. Their features are various; but the moft diftinguifhing trait of the countenance is a fullnefs at the point of the nofe. Their eyes and teeth are good; but the latter are not fo white nor fo well fet as thofe generally obferved among Indian nations. The women are deftitute of that ftrong flefhy firmnefs which appears in the men. Their features indicate the delicacy of their fex, and lay claim to a confiderable fhare of beauty and expreffion. The bodies and limbs of moft of the females are well proportioned, and fome of them are perfect models of a beautiful figure. However, the moft remarkable diftinction of the women is the uncommon fmallnefs and delicacy of their fingers, which vie with the fineft in Europe. The general colour is a caft deeper than the copper brown; but feveral of the men and women have a true olive complexion, and fome of them are much fairer. But this may be owing to their being lefs expofed to the fun; as a tendency to corpulence among fome of the principal people feems to be the confequence of a more indolent life. The fkin of the general mafs of the people is, more commonly, of a dull hue, with fome degree of roughnefs, which may perhaps be occafioned by fome cutaneous difeafe. There are, however, few defects or deformities to be found amongft them. But they are fubject to a fort of blindnefs, occafioned by a difeafe of the cornea: to a kind of tetter or ring-worm; and to large broad ulcers, which in fome cafes disfigure them much and deftroy the whole or part of the nofe. This feems to indicate venereal contagion, which is known to prevail amongft them. There are two other difeafes frequent among them: one of thefe is an indolent firm fwelling, which attacks the legs and arms, and caufes them to fwell to a very large fize: and the other is a tumour of the fame fort in the tefticles. Upon the whole, they may, for the moft part, be confidered as a healthy people. They walk with a graceful air and firm ftep; their countenances fhew the mildnefs and good nature for which they are diftinguifhed: they are frank, cheerful, and good-humoured: though in the prefence of their chiefs they affume a grave or ferious afpect, which has the appearance of referve. Their difpofition is fingularly peaceable, and they exercife hofpitality and kindnefs to ftrangers. They are well acquainted with the mode of trading by barter; and perhaps, fays captain Cook, no nation in the world trafficks with more honefty or lefs diftruft. Upon the whole, they feem to poffefs many of the moft excellent qualities which adorn the human mind; fuch as induftry, ingenuity, perfeverance, affability, and probably other virtues which have efcaped obfervation. The only defect that fullies their character is a propenfity to thieving, which very much prevails among them, and which captain Cook candidly afcribes to an intenfe curiofity or defire to poffefs fomething to which they had not before been accuftomed, or that belonged to a fort of people fo different from themfelves. Their hair is in general ftraight, thick, and ftrong, and of a black colour; though it is fometimes bufhy or frizzled, or ftained of a brown, purple, or orange colour. Some have the hair cut off on one fide, while on the other it remains long; fome have it wholly cut off, except a fingle lock on one fide. The women, in general, wear it fhort; and both men and women ftrip the hair from their arm-pits. The men are ftained from about the middle of the belly to about half down the thighs with a deep blue colour; which is done with a flat bone inftrument, cut full of fine teeth, which being dipped in the colouring matter, is afterwards ftruck into the fkin with a ftick, and thus indelible marks are made. Thus they have various lines and figures, which are very elegant, both from their variety and arrangement. The women have only a few fmall lines or fpots, thus imprinted in the infide of their hands. Their kings are exempted from this cuftom. The men are all circumcifed, or rather fupercifed; as the operation confifts in cutting off only a fmall piece of the forefkin, at the upper part, fo that it is incapable of covering the glans; which operation they profeffedly perform from a notion of cleanlinefs. A more extraordinary cuftom prevails in thefe ifles, which is that of mutilating themfelves by the lofs of one or both of their little fingers. They alfo burn or make incifions in their cheeks, near the cheek-bones. The drefs of both the men and women confifts of a piece of cloth or matting, long enough to pafs once and a half round the waift, to which it is confined by

a girdle

a girdle or cord; it is double before, and hangs down like a petticoat, as low as the middle of the leg: the upper part above the girdle is plaited into feveral folds, fo that, when unfolded, there is cloth fufficient to draw up and wrap round the fhoulders. The ornaments worn by perfons of both fexes are amulets, necklaces, and bracelets of bones, fhells, and beads of mother of pearl, tortoife-fhells, &c. The women alfo wear on their fingers neat rings made of tortoife-fhell, and pieces in their ears about the fize of a fmall quill. They have alfo a curious apron made of the outfide fibres of the cocoa-nut fhell, and compofed of a number of fmall pieces fewed together in fuch a manner as to form ftars, half-moons, little fquares, &c. It is ftudded with beads of fhells, and covered with red feathers, fo as to have a pleafing effect. They are very attentive to perfonal cleanlinefs, and therefore frequently bathe in the ponds: neverthelefs, the women rub themfelves all over with a yellow pigment, which feems to be a fine powder of turmeric, and they are fo immoderately fond of cocoa-nut oil, that they pour it in great quantities upon their heads and fhoulders, and rub their bodies over with it. The employment of the women is chiefly of the domeftic kind, and the manufacture of their cloth is wholly configned to their care. This cloth is made of different degrees of finenefs: the coarfer fort receives no pattern, and of the fineft fort, they have fome that is ftriped and chequered, and differently coloured: their colours being black, brown, purple, yellow, and red, all procured from vegetables. Their cloth in general, which is made of the fame materials as at Otaheite, will refift water for fome time; and they have a method of glazing it, which renders it in this refpect preferable to that of Otaheite. They alfo manufacture various forts of matting, fome of which is of a very fine texture, and ufed generally for clothing, whilft the thicker and ftronger fort ferves for fleeping on, and for fails to their canoes, &c. Among other ufeful utenfils, they have various forts of bafkets, fome made of the fame vegetable materials with their mats, and others of the twifted fibres of cocoa-nuts. Thefe are not only durable, but beautiful, being generally compofed of different colours, and ftudded with beads made of fhells or bones. The province of the men is more laborious and extenfive than that of the women; the objects of their care are agriculture, architecture, boat-building, fifhing, and other articles relating to navigation. Their plantains and yams engage much of their attention and labour; and in cultivating them their inftruments are merely pickets or ftakes of different lengths, according to the depths which they have to dig. The cocoa-nut and bread-fruit trees, and fome other trees which they plant, are difperfed about in lefs order than the former, and feem to give them no trouble. In building their houfes, ingenious as they are in other refpects, they difplay little tafte. Thofe of the lower people are poor huts, fmall, and barely fufficient to defend them from the weather. Thofe of the better fort are larger and more comfortable, but much inferior to what might be expected. Their houfe is, properly fpeaking, a thatched roof or fhed, fupported by pofts and rafters; the floor is raifed with earth fmoothed, covered with ftrong, thick matting, and kept very clean. Moft of them are clofed on the weather fide with ftrong mats, or branches of the cocoa-nut tree, plaited or woven into each other, and anfwering the purpofe of a wall. A thick, ftrong mat, bent into the form of a femicircle, envelopes a fpace in which the mafter and miftrefs of a family fleep; the reft of the family fleep upon the floor; the unmarried men and women apart from each other. The fervants retire in the night, when the family is large, to adjoining huts. Their whole furniture confifts of a bowl or two, a few gourds, cocoa-nut fhells, fmall wooden ftools, which ferve for pillows, and, perhaps, a large ftool for the chief, or mafter of the family, to fit upon. As they are fond of living much in the open air, they are lefs attentive to ornamental architecture. In naval architecture, however, they excel, as we may infer from the curious ftructure of their canoes, already mentioned. The tools they ufe in the conftruction of their boats are hatchets, or rather thick adzes, of a fmooth black ftone, that abounds at Toofoa; augres made of fhark's teeth, fixed on fmall handles; and rafps, of a rough fkin of a fifh, faftened on flat pieces of wood. As knives, they ufe different fhells. Their cordage is made from the fibres of the cocoa-nut hufk. The other manual employments confift chiefly of making mufical reeds, flutes, warlike weapons, and ftools or pillows, upon which they fleep. Their reeds have eight, nine, or ten pieces placed parallel to one another, but not in any regular progreffion, reftricted commonly to fix notes, but incapable of producing mufic diftinguifhable by the ears of Europeans. The flutes are a joint of bamboo, clofe at both ends, with a hole beneath, and four others, two of which, and one of the firft only, are ufed in playing. They apply the thumb of the left hand to clofe the left noftril, and blow into the hole at one end with the other. The middle finger of the left hand is applied to the firft hole on the left, and the fore-finger of the right to the loweft hole on that fide: and thus, though the notes are only three, they produce a pleafing, yet fimple mufic, which they vary much more than one would think it poffible, with an inftrument fo imperfect. They have alfo a drum, which may be compared to a hollow log of wood, about five feet fix inches long, and thirty inches in girt, with a flit in it from the one end to the other, about three inches wide, by means of which it had been hollowed out. On the fide of this log they beat with two drum-fticks, and produce an hollow found, not quite fo mufical as that of an empty cafk. Their weapons are clubs of different forts, and much ornamented, fpears, and darts. They have alfo bows and arrows, defigned merely for amufement, fuch as fhooting at birds; and not for military purpofes. Their ftools are about two feet long, but only four or five inches high, and nearly four broad, bending in the middle, with four ftrong legs and circular feet, all made of wood neatly polifhed and fometimes inlaid with bits of ivory.

The greateft part of their vegetable diet confifts of yams, plantains, and cocoa-nuts. The chief articles of their animal food are hogs, fowls, fifh, and all forts of fhell-fifh; but the lower people eat rats. Their food is generally dreffed by baking, in the fame manner as at Otaheite. At their meals they drink nothing but water, or the juice of the cocoa-nut. The women are not excluded from eating with the men; but there are certain orders or ranks among them, that can neither eat nor drink together. This diftinction begins with the king. The time of their meals feems not to be fixed. They go to bed as foon as it is dark, and rife with the dawn in the morning: but they frequently fleep in the day. They are fond of fociety, and frequently quit their houfes or huts for the purpofe of converfing together, or engaging in other amufements. Their private diverfions are chiefly finging, dancing, and mufic, performed by the women. When two or three women fing in concert, and fnap their fingers, it is called "oobai;" but when there is a greater number, they divide into feveral parties, each of which fings in a different key, which makes very agreeable mufic, and is called "heeva" or "haiva." In the fame manner they vary the mufic of their flutes, by playing on thofe of a different fize; but their dancing is

much

much the fame as when they perform publicly. The bulk of the people fatisfy themfelves with one wife; but it does not appear whether their marriages are made lafting by any kind of folemn contract. The chiefs, however, have commonly feveral women, one of whom, as it was thought, was regarded as the miftrefs of the family. The women in general appeared to be modeft, though there is no want of thofe of a different character. Such, however, appeared to be of the loweft clafs, among whom were proftitutes by profeffion. The humanity of thefe people is ftrikingly evinced by the concern they fhew for their dead. Their mourning is expreffed, not only by words but by deeds. They beat the teeth with ftones, ftrike a fhark's tooth into the head until the blood flows in ftreams, and thruft fpears into the inner part of the thigh, into their fides below the arm-pits, and through the cheeks into the mouth. The deceafed is buried after being wrapped up in mats and cloth, much after the European manner. The chiefs have the "fiatookas" appropriated to them as burial-places; but the common people are interred in no particular fpot. They have long and general mourning, which indicates that they confider death as a very great evil. And this is further confirmed by the very odd practice to which they refort for averting it, which is that of cutting off one or both of their little fingers when they think themfelves in danger of dying; fuperftitioufly fuppofing that the deity will accept of the little finger as a fort of facrifice efficacious enough to procure the recovery of their health. They cut it off with one of their ftone hatchets. From the rigid feverity with which fome of their mourning and religious ceremonies are performed, it might be apprehended that they thus meant to fecure to themfelves felicity beyond the grave; but their principal object relates to things temporal. However they feem, according to the account given of their religion by Mr. Anderfon, to entertain very proper fentiments about the immateriality and immortality of the foul; and he thinks himfelf warranted in afferting, that they do not worfhip any thing that is the work of their own hands, or any vifible part of the creation. They neverthelefs admit a plurality of fubordinate deities, prefiding over the different elements of nature; and their notions of the future condition of the deceafed are blended with many abfurdities. They do not make any offerings of hogs, dogs, and fruit, as at Otaheite, unlefs it be emblematically; for their "Morais" were perfectly free from every thing of the kind. But no doubt is entertained as to their offering real human facrifices. Their "Morais," or "fiatookas," are, as at Otaheite, and many other parts of the world, burying-grounds and places of worfhip; though fome of them feemed to be only appropriated to the firft purpofe; but thefe were fmall, and, in every other refpect, inferior to the others. Their government, as we have before obferved, is monarchical, but not defpotic. A fubordination feems to be eftablifhed among them, that refembles the feudal fyftem of our progenitors in Europe. But, however independent on the defpotic power of the king the great men, or chiefs, may be, people of the lower order have no property, nor fafety for their perfons, but at the will of the chiefs to whom they belong. The inhabitants of Tongataboo, where the king refides, call this ifland the "land of chiefs;" while the fubordinate ifles are diftinguifhed by the appellation of "lands of fervants." The chiefs are ftyled by the people, not only lords of the earth, but of the fun and fky; and the king's family affume the name of "Futta-faihe" from the god fo called, who is probably their tutelary patron, and perhaps their common anceftor. There is a decorum obferved in the prefence of their principal men, and particularly of their king, that is truly admirable. In addreffing the king, they fit down before him; and to fpeak to the king ftanding would be accounted here as a mark of rudenefs. It does not appear, indeed, that any of the moft civilized nations have ever exceeded thefe people in the great order obferved on all occafions; in ready compliance with the commands of their chiefs; and in the harmony that fubfifts through all ranks, and unites them, as if they were all one man, informed with, and directed by, the fame principle. To their fovereign they exprefs their refpect and homage by every poffible token of deference and fubmiffion. It appears, however, that if the king fhould not govern according to law or cuftom, the principal officer that prefides over the police would be ordered by the other great men, or by the people at large, to put him to death. A fovereign thus liable to be controuled, and to be punifhed for an abufe of power, cannot be called a defpotic monarch. When we confider the number of iflands that compofe this little ftate, and the diftance at which fome of them lie from the feat of government, attempts to throw off the yoke, and to acquire independency, it fhould feem, might be apprehended. But this, it is faid, never happens. One reafon why they are not difturbed by domeftic quarrels may be this: that all the powerful chiefs, whatever property they may poffefs in other iflands, refide at Tongataboo. They alfo fecure the dependence of the other iflands by the celerity of their operations; for if, at any time, a troublefome and popular man fhould ftart up in any of them, the generaliffimo or prefiding officer of the police, is immediately difpatched thither to kill him: and they thus crufh a rebellion in its infancy.

The common method of faluting one another in thefe iflands is by touching or meeting nofes, as is done in New Zealand; and their token of peace to ftrangers is the difplay of a white flag or flags. A very fingular cuftom prevails among them of putting every thing you give them to their heads, by way of acknowledgment. This mode of paying a compliment is taught them from their infancy.

The language of the Friendly Iflands has the greateft affinity imaginable to that of New Zealand, of Wateeoo, and Mangeea; and confequently to that of Otaheite, and the Society Iflands. The mode of pronunciation differs; neverthelefs a great number of words are either exactly the fame, or fo little changed, that their common original may be fatisfactorily traced. Several hundred words were collected by Mr. Anderfon; and, amongft thefe, are terms that exprefs numbers as far as a hundred thoufand; beyond which they would never reckon: for having proceeded thus far, they commonly ufed a word which expreffes an indefinite number. Cooke's Second Voyage, vol. i. Cooke's Third Voyage, vol. i.

Friendly *Societies* denote affociations, chiefly among the moft induftrious of the lower and middling clafs of tradefmen and mechanics, for the purpofe of affording each other relief in ficknefs; and their widows and children fome affiftance at their death. Thefe have been thought worthy of the protection of the legiflature, to prevent frauds which had arifen from the irregular principles on which many of them were conducted.

The ftatute 33 Geo. III. c. 54. provides that any number of perfons may form themfelves into a fociety, and raife among themfelves a fund for their mutual benefit, and make rules and impofe fines.—The rules, declaring the purpofe for which fuch focieties are eftablifhed, are to be exhibited to the quarter feffions, who may annul or confirm them; in which latter cafe they are to be figned by the clerk of the peace. No rule thus confirmed is to be altered but at a general

general meeting of the fociety, and fubject to the controul of the feffions. Societies may appoint officers, who are to give fecurities for their truft; the treafurer or truftees by bond to the clerk of the peace, and other perfons to the treafurer or truftees; which bonds are exempted from the ftamp-duty. Committees of not lefs than eleven members may be appointed; their powers to be declared by the fociety, and fubject to their controul. Treafurers and truftees are enabled to lay out fubfcriptions in purchafe of ftock, &c. and to fell and change funds for the ufe of the fociety; to render accounts, and pay over balances.—In cafe of mifbehaviour of truftees, application is to be made to the court of chancery, in which proceedings are to be free of all expence of fees, ftamps, &c. and counfel to be affigned gratis by the court. Executors or affignees of truftees, &c. dying, or becoming bankrupt, to pay the demands of the fociety in the firft place. Effects of the focieties are vefted in treafurers and truftees, who may bring and defend actions. —Societies are not to be diffolved without confent of five-fixths of the members.—Rules entered in a book are to be received as evidence.—Societies may receive donations.—Complaints of members againft ftewards, &c. are to be fettled by two juftices. If rules direct difputes to be fettled by arbitration, the award of the arbitrators fhall be final.—Members of focieties producing certificates of fteward, &c. are not to be removable till they become actually chargeable; and fimilar provifions are made relative to thofe as to other certificates under the poor laws. See the article POOR.

FRIENDS, in *Ecclefiaftical Hiftory*, a denomination affumed by a refpectable clafs of perfons, and which, as we are informed, they prefer to that of *Quakers*, by which they are alfo generally known. For an account of them, fee QUAKERS.

FRIENDS *Alien*. See ALIEN.

FRIENDSHIP, in *Moral Philofophy*, denotes that mutual attachment between different perfons, which proceeds from a cordial efteem of the mental and moral qualities of one another; and which fuppofes, or produces, in a confiderable degree, fimilarity of difpofition and character, frequency of intercourfe, union of interefts, and a reciprocity of confidence, good wifhes, and kind offices. "Friendfhip," fays Voltaire, "is a tacit contract between two fenfible and virtuous perfons: *fenfible*, I fay; for a monk, or a hermit, may not be wicked, and yet may live a ftranger to friendfhip. I add *virtuous*; for the wicked have only accomplices, the voluptuous have companions, the defigning have affociates, the men of bufinefs have partners, the politicians form a factious band; the bulk of idle men have connections; princes have courtiers; but virtuous men alone have friends. Cethegus was Catiline's accomplice; and Mæcenas was Octavius's courtier; but Cicero was Atticus's *friend*." Without virtue there can be no genuine, permanent friendfhip, but whilft thofe eftimable qualities fubfift, that produce harmony of minds, and that bind true friends to each other, their friendfhip will continue, and will be rendered immortal.

Friendfhip, fays lord Shaftefbury, is *that peculiar relation* which is formed by a confent and harmony of minds, by mutual efteem, and reciprocal tendernefs and affection. Such was that between the two Jewifh heroes, David and Jonathan. (2 Samuel, ch. i.) Such were thofe friendfhips defcribed fo frequently by poets, between Pylades and Oreftes, Thefeus and Pirithous, with many others. Such were thofe between philofophers, heroes, and the greateft of men; between Socrates and Antifthenes, Plato and Dion, Epaminondas and Pelopidas, Scipio and Lælius, Cato and Brutus, Thrafea and Helvidius.

The friendfhip of which we are now fpeaking does not originate in felfifh, interefted views; and when it is formed and eftablifhed, it excludes fufpicion, jealoufy and referve, and is maintained by a free, candid, liberal intercourfe, which is not foon nor eafily interrupted by difcord, or which mutual explanation fpeedily revives, and renewed affection perpetuates. This kind of friendfhip has been highly extolled by philofophers, poets and divines, and they have concurred in defcribing its excellence, enumerating its benefits, and recommending the cultivation and exercife of it. Lord Bacon has an excellent "Effay on Friendfhip;" and Dr. Young in his "Night Thoughts" thus defcribes and recommends it:

"Friendfhip's the wine of life; but friendfhip new
——————————is neither ftrong nor pure."

"Deliberate on all things with thy friend:
But fince friends grow not thick on ev'ry bough,
Nor ev'ry friend unrotten at the core;
Firft, on thy friend, delib'rate with thyfelf:
Paufe, ponder, fift; not eager in the choice,
Not jealous of the chofen; fixing, fix:
Judge before friendfhip, then confide till death."

Lord Shaftefbury (ubi fupra) animated, fays an ingenious writer, with a warm fenfibility of the moral charms of this generous affection, and not being able, it feems, to difcover that it is either enjoined or encouraged by the Chriftian inftitution, imputes this pretended omiffion as a capital defect in the code of evangelical ethics. On the contrary, a late ingenious advocate for that facred caufe, which it was the unhappy direction of this accomplifhed nobleman's learning and talents to depreciate; far from difcerning any thing laudable or meritorious in private friendfhip, has attempted to prove, that "it is totally incompatible with the genius and fpirit of the gofpel." Thus the very fame fuppofed circumftance which appears to have been no inconfiderable obftruction to the noble philofopher's faith, is affigned by the elegant defender of Chriftianity, as one of thofe internal marks which authenticate its divine origin! The fame mode of reafoning, however, which overturns either of the refpective pofitions of thefe admired writers, will equally confute both. That private friendfhip does not exprefsly enter into the precepts of Chriftianity, is unqueftionably true; for the nature of the connection neceffarily excludes it from being the fubject of a religious or moral obligation. The diftinctive character of this relation confifts in a fpontaneous fentiment of the heart, unconftrained and uninfluenced by compulfive or external motives of every kind and degree. To attempt therefore to produce a voluntary affection, by the authority of a pofitive command, would be to publifh a law evidently deftructive of its own end; for its fanctions could no fooner operate as a primary, or determining inducement, than the fentiment they were defigned to create would thereby be prevented from exifting. Befides, a general ordinance for this purpofe would not merely be abfurd, it would be unjuft; becaufe it would require univerfally what is not in every man's power to perform. A great variety of circumftances muft concur to form and cement this union; and thefe are of a nature fo exceedingly contingent and fortuitous, that they are frequently never realized in the courfe of the longeft life. Indeed, they fo rarely meet together, that what a fagacious obferver of mankind remarks concerning love, holds equally true in refpect to *friendfhip*: "Il eft du *veritable* comme de l'apparition des efsprits: tout le monde en *parlé*, mais peu de gens ont *vû*."

Moreover, if what the noble author requires from revelation is, in the firft inftance, inconfiftent with the effential nature

ture of its object, it implies, in the next place, an assertion no less contrary to fact; for although friendship could not, either in reason or justice, have been commanded by the precepts, it is evidently encouraged by the spirit of Christianity; universal benevolence, or good will to mankind, is the vital principle that animates and pervades the whole system of evangelical morality; and it is by a proper cultivation of this enlarged and comprehensive virtue, that the heart is best prepared and qualified to enter into the engagements, and discharge the offices of private friendship. This the noble moralist himself acknowledges in another place. "Do you think," he says, "that particular friendship can well subsist without such an enlarged affection and sense of obligation to society?" This kind of reasoning, however, when applied to revelation, will not satisfy his demands; he contends that "friendship is no essential part of a Christian's charity." But if there were any force in this objection, it would overshoot its intended aim, and wound natural religion no less than revealed; as friendship, for the reasons above assigned, can no more be the essential part of a theist's benevolence, than it is of a Christian's.

It deserves also to be considered, that our blessed Lord acted wisely in not inculcating, by express and positive command, private friendship, though he recommended it generally both by his doctrine and example. His commission was primarily addressed to the Jews, and his religion was designed to abolish all those distinctions of nation, party, and external privilege, that separated between them and the Gentile world. The Jews were prone to indulge selfish and limited affections, and to restrict their benevolence to persons of their own nation and profession. Our Lord therefore very wisely declines to recommend by positive law private friendship, and inculcates universal benevolence as best adapted to the dispositions and circumstances of the Jewish people, and as the most suitable preparation for the introduction of the Gentiles to a participation in common with the Jews, of the benefits and privileges which he was empowered to impart.

We may observe, however, that it is not solely by necessary implication, or circumstantial inferences, that the Christian revelation recognizes friendship. It strongly and expressly recommends and encourages this amiable alliance; if, exhibiting it in the noblest and most animating examples may be allowed to have an immediate and direct influence over the heart of man. Two very remarkable instances for this purpose occur in the history of our Saviour's life. The Evangelist, in relating the miracle which Christ performed at Bethany, by restoring a person to life, who had lain some days in the grave, introduces his narrative by emphatically observing that "Jesus loved Lazarus," intimating, it should seem, that the sentiments which Christ entertained of Lazarus were a distinct and peculiar species of that general benevolence with which he was actuated towards all mankind. Accordingly the sisters of Lazarus did not mention his name, but pointing him out to Jesus by a more honourable and equally notorious designation, the terms of their message were, "Behold! He whom thou lovest is sick." And when our Lord informs his disciples of the notice he had thus received, his expression is, "Our friend Lazarus sleepeth." We observe that Christ did not upon this occasion use the word "friend" in its loose, undistinguishing acceptation, but in a restrained, and strictly appropriated sense; as is manifest, not only from this plain account of the fact itself, but as the sequel farther evinces. For, as he was advancing to the grave, accompanied with the relations of the deceased, he discovered the same emotions of grief as swelled the bosoms of those with whom Lazarus had been most intimately connected; and sympathizing with their common sorrow, he melted into tears. This circumstance was too remarkable to escape particular observation; and it drew from the spectators, what we should think it must necessarily draw from every reader, this natural and obvious reflection, "behold! how he loved him!"

But in the concluding catastrophe of our Saviour's life, he gave a still more decisive proof that sentiments of the strongest personal attachment and friendship were not unworthy of being admitted into his sacred bosom; they were too deeply, indeed, impressed, to be extinguished even by the most excruciating torments. In those dreadful moments, observing among the afflicted witnesses of his painful and ignominious sufferings, that faithful follower, whom he had selected as his friend out of the small band of his twelve apostles, and who is described by the historian as "the disciple whom he loved;" he distinguished him by the most convincing instance of superior confidence, esteem, and affection that was ever exhibited to the admiration of mankind. For, under circumstances of the most agonizing torments, when it might be thought impossible for human nature to retain any other sensibility but that of its own inexpressible sufferings, he recommended to the care and protection of this his tried and approved friend, in terms of peculiar regard and endearment, the most tender and sacred object of his private affections. But no language can represent this pathetic and affecting scene with a force and energy equal to the sublime simplicity of the evangelist's own narrative: "Now there stood by the cross of Jesus his mother, and his mother's sister, and Mary Magdalen. When Jesus saw his mother, and the disciple standing by, whom he loved; he saith to his mother, behold thy son! then he saith to the disciple, behold thy mother! And from that hour that disciple took her to his own home." It may safely be asserted, that among all those memorable examples of friendship which have been celebrated with the highest encomiums by the ancients, there cannot be produced a single instance in which the most distinguishing features of exalted amity are so strongly displayed, as in the foregoing relation. The only one, perhaps, that bears even a faint similitude to it, is that famous transaction recorded by a Greek author, which passed between Eudamidas and Aretheus. But when the very different circumstances attending the respective examples are duly considered, it must be acknowledged that the former rises as much above the latter in the proof it exhibits of sublime friendship, as it does in the dignity of the characters concerned.

Upon the whole then it appears, that the divine founder of the Christian religion, as well by his own example as by the spirit of his moral doctrine, has not only encouraged but consecrated friendship. We are indebted for most of the preceding observations to the ingenious William Melmoth, esq. in the concluding note to his elegant translation of Cicero's "Lælius," or, "An Essay on Friendship, by Marcus Tullius Cicero," with remarks, p. 328—343.

FRIERA, in *Geography*, a town of Portugal, in the province of Tra los Montes; 12 miles S. W. of Outeiro.

FRIER'S COWL, in *Botany*. See ARUM.

FRIER'S *Head*, a cape on the E. coast of the island of Antigua. N. lat. 17° 11'. W. long. 61° 22'.

FRIESACH, a town of Germany in the Middle Mark of Brandenburg, on the Rhine; 28 miles N. W. of Berlin. N. lat. 52° 48'. E. long. 12.° 41'.

FRIESEN, a town of the duchy of Stiria; 9 miles N. N. E. of Wendischgratz.

FRIESLAND,

FRIESLAND, one of the ſtates or departments of Holland, ſo called from the Friſons, an ancient warlike people, whoſe country formerly extended from the Scheldt to the Weſer. (See FRISONS.) It is bounded on the north by the German ocean, on the eaſt by Groningen and Overyſſel, on the ſouth by Overyſſel and the Zuyder ſea, and on the weſt by the Flie or Vlie river. Frieſland, particularly in its N.W. parts, which lie lower than the ſea, reſembles Holland in its air and ſoil, and is famous for its paſtures, ſupplying butter in ſuch quantities as to be a ſtaple article of commerce, and breeding excellent oxen, cows, and ſheep, and alſo large horſes. In the more elevated parts there is ſome good corn land, which affords wheat that has been held in eſtimation for the fineneſs of the ear, and the whiteneſs of the flour. The chief article of fuel is peat, and towards the ſouth and ſouth-eaſt there are extenſive heaths and foreſts of wood. For want of ſand-hills near the coaſt this country is defended at a great expence from the encroachments of the ſea by dykes. The canals of Frieſland are numerous; and ſerve not only for carrying off the ſuperfluous waters into the ſea, but for the purpoſes of commerce. The principal of theſe reaches from Harlingen through Franeker as far as Leewarden, the capital of the country, and Dokkum, and Groningen, and even to the frontiers of Eaſt Frieſland. The whole province contains 11 towns and 336 villages. The inhabitants long retained that love of liberty and martial ſpirit which diſtinguiſhed their anceſtors, and many of thoſe cuſtoms, and that mode of living, which were tranſmitted to them from their progenitors; they have alſo preſerved among them the old Friſian dialect and accent, which renders the language of the country people unintelligible to the other Hollanders. Frieſland is famous for its woollen ſtuffs, and more eſpecially for its linen, which is the fineſt in Europe. This province, being a part of the ancient Friſia, had formerly princes of its own, afterwards dukes, and then kings: among whom Radbold II. was particularly celebrated. Theſe laſt were ſucceeded by podeſtats, ſelected from among the people. In the year 1436 part of Frieſland devolved to the houſe of Burgundy. In 1498 the emperor Maximilian I. created duke Albert of Saxony hereditary governor of Frieſland, under a ſtipulation that he ſhould maintain their ancient liberties; nevertheleſs they would never acknowledge him. In 1515 Charles V. purchaſed of George duke of Saxony his claim to this country, and ſubjected it to his own dominions; but under his ſon Philip II. the Friſons recovered their liberty, and acceded to the alliance of Utrecht. Since the United Provinces have been erected into a kingdom, and aſſigned by the emperor of France to his brother Louis, Frieſland forms a part of this treaty; and by the new conſtitutional code ſends three members to the legiſlative body. What farther changes await it, time muſt diſcloſe.

FRIESLAND, *Eaſt*, a principality of Germany belonging to Pruſſia, is bounded on the north by the ſea, on the eaſt by the county of Oldenburgh, on the ſouth by the biſhopric of Munſter, and on the weſt by Groningen; about 38 miles from north to ſouth, and 36 from eaſt to weſt. The population, according to Hoeck, conſiſts of 102,594 perſons. The air, though moiſt and thick, is purified by ſea breezes; the ſpring and harveſts are late; the land is flat and low, and defended againſt the ſea by ſtrong and lofty dykes. Along the coaſt the ſoil is rich and fertile, and the land conſiſts chiefly of meadows, with ſome few corn fields. The cattle, ſheep, and horſes are of a large ſize and good quality. The butter and cheeſe are abundant and rich. The central part of the country is generally ſandy, interſperſed with fens and moors, whence the inhabitants ſupply themſelves with peat for fuel, as wood is ſcarce. The country abounds with game and fowl; and its geeſe are of an uncommonly large ſize. One-third part of this principality is uncultivated. The chief river is the Ems, which contributes to render the trade and navigation of this province very conſiderable. The exportation principally conſiſts in large horſes, horned cattle, cheeſe, butter, oats, beans, rape-ſeed, and fine linen. Anciently Eaſt Frieſland was divided into a great number of lordſhips, moſt of which ſubmitted, in the year 1430, to Edzard, ſurnamed Cyrkſena or Syrkſena, whoſe ſucceſſors became princes of the empire in 1454, under the title of count. After this family had become extinct, Frederick II. king of Pruſſia, in 1744, ſeized on the province, in conſequence of an expectancy granted to the houſe of Brandenburg by the emperor Leopold in the year 1694. But George II. king of England, being of the houſe of Brunſwick Luneburg, proteſted, and claimed the principality, on account of an hereditary union entered into in the year 1691, with prince Chriſtian Eberhard; and made known his pretenſions to the regency of Eaſt Frieſland, and to the Aulic chamber of the empire. However, the king of Pruſſia, denying the authority of the emperor and regency, and threatening to ſupport his claim by force of arms, was permitted to remain in undiſturbed poſſeſſion. The inhabitants are Lutherans and Calviniſts; but the Catholics enjoy toleration in many towns, and the Moravians at Emden, Leer, and Norden. The Jews are alſo tolerated. The nobility, lords, and peaſants form the ſtates, whoſe tranſactions with their princes, joined to the imperial ordinances, ſerve for the laws of the country. The ſtates conſent to taxes and raiſe them; the revenue of the ſovereign is about 300,000 rix-dollars. The principal towns are Aurich, Norden, and Emden.

FRIESLANDERS, in *Eccleſiaſtical Hiſtory*, a ſect of moderate Anabaptiſts, deriving their name from Frieſland, the country which they inhabit. See WATERLANDIANS.

FRIEZE, FRIZE, or FREEZE. See FREEZE.

FRIGATE, in *Sea Affairs*, a ſhip of war, uſually of two decks, light built, deſigned for ſwift ſailing. When it hath but one deck, and conſequently is of a ſmaller ſize, they call her a light frigate.

Frigates mount from twenty to thirty-eight guns, and are eſteemed excellent cruiſers. The name was formerly known only in the Mediterranean, and applied to a long kind of veſſel, navigated in that ſea with ſails and oars. The Engliſh were the firſt who appeared on the ocean with theſe ſhips, and equipped them for war as well as for commerce.

FRIGATE-*built* denotes the diſpoſition of the decks of ſuch merchant ſhips as have a deſcent of four or five ſteps from the quarter deck and fore-caſtle into the waiſt, in contradiſtinction to thoſe whoſe decks are on a continued line for the whole length of the ſhip, which are called galley-built. See *Fluſh*-DECK.

FRIGATE-*bay*, in *Geography*, a bay on the S. coaſt of the iſland of St. Chriſtopher; two miles E.S.E. of Baſſeterre.

FRIGATOON, a Venetian veſſel, commonly uſed in the Adriatic, built with a ſquare ſtern, and without any fore-maſt, having only a main-maſt, mizen-maſt, and bowſprit.

FRIGENO, in *Geography*, a town of Italy, in the department of the Adda and Oglio; ſeven miles N.N.E. of Breno.

FRIGENTUM, in *Ancient Geography*, a town of Italy, E. of Eclana or Æculanum, to which it ſucceeded in power.

FRIGERATORY, among *Builders*, denotes a place intended to keep things cool in fummer.

FRIGHT, a fudden and violent degree of fear. (See FEAR.) This paffion has been known not only to caufe, but to cure difeafes. Epilepfy, ftupor, madnefs, &c. have in fome inftances been produced by frights. Mr. Boyle mentions agues, gout, and fciatica, cured by this means. It is a commonly known cure for the hiccough, to put the patient in a fudden fright.

FRIGID, FRIGIDUS, *cold*, is varioufly ufed. A frigid ftyle, is a low, jejune manner of diction; wanting force, warmth of imagination, figures of fpeech, &c. This, and the bombaft, are the two chief faults oppofite to the *fublime*, which fee. The frigid confifts in degrading an object, or fentiment, which is fublime in itfelf, by our mean conception of it, or by our weak, low, and childifh defcription of it; this betrays entire abfence, or at leaft great poverty of genius. Of this there are numerous examples commented upon with much humour, in the treatife on the art of finking, in Dean Swift's works; the inftances being taken chiefly from fir Richard Blackmore. The *Bombaft* (which fee) lies, in forcing an ordinary or trivial fubject out of its rank, and endeavouring to raife it into the fublime; or in attempting to exalt a fublime object beyond all natural and reafonable bounds. Writers of genius may fometimes fall into this error, which is too common, by unluckily lofing fight of the true point of the fublime. This is alfo called *Fuftian*, or *Rant*. Shakefpeare is not altogether unexceptionable in this refpect. Dryden and Lee, in their tragedies, abound with it.

FRIGID *Zone*, or *Frozen Zone*, in *Geography*. See ZONE.

FRIGIDITY is alfo ufed in the fame fenfe with impotence.

FRIGIDUS, in *Ancient Geography*, a river of Italy, in Venetia, which rofe in the Alpes Carnicæ, ran towards the weft, watered a place called Caftra, and difcharged itfelf into the Sontius near Pons Sontii.

FRIGILIORA, in *Geography*, a town of Spain, in Grenada; 13 miles E. of Velez Malaga.

FRIGNANO, a town of Italy, in the department of the Panaro; 15 miles S. of Modena.

FRIGORIFIC, of *frigus*, *cold*, and *facio*, *I make*, in *Phyfics*, fomething that occafions cold. Some philofophers, particularly Gaffendus, and other corpufcularians, denying cold to be a mere privation, or abfence of heat, contend that there are actual frigorific corpufcles, or particles, as well as fiery ones: whence proceed *cold* and *heat*; which fee. See alfo CONGELATION, FREEZING, and FREEZING *Mixtures*.

FRIKEN, in *Geography*, a lake of Sweden, in Warmeland, 40 miles in length, but narrow.

FRILL, in *Falconry;* when a hawk trembles or fhivers, they fay fhe frills. Dict. Ruft.

FRILLENDORF, in *Geography*, a town of Germany, in the county of Ziegenhayn; five miles N.N.E. of Ziegenhayn.

FRIM, in *Agriculture*, a term employed to denote any fort of plant which is full of juice. It is often applied to grafs and grain while young, and in a tender ftate of growth.

FRINGE OF MOSSES, *Periftomium*, in *Botany*, a fimple or double row of feparate or connected teeth, which border the orifice of the capfule in almoft all the genera of Moffes, and are originally covered by the lid and veil. When thofe parts are fallen, the fringe becomes confpicuous. It is a very fenfible hygrometer, for the moft part expanding by drought, to allow of the difcharge of the feeds. Sometimes however the fringe is expanded by moifture, and folds together in a dry ftate of the atmofphere. The outer fringe, which is in many cafes the only one, is of a much firmer texture, and more deeply coloured, than the inner. It confifts either of 4, 8, 16, or 32 teeth, which numbers are as conftant and invariable in all cafes, as in any other inftance in natural hiftory, and far more fo than thofe numerical differences in general by which the characters of more fplendid flowers and fruits are defined. The inner fringe is moftly a fine plaited membrane, entire at the bafe, but varioufly toothed, jagged, or perforated in the upper part. Sometimes however the inner fringe confifts of feparate teeth like the outer, only much more delicate. All the parts in queftion are, in feveral inftances, very brittle and fugacious, but in general they are tolerably durable.

The celebrated Hedwig firft fuggefted the ingenious and fortunate idea of making the fringe of moffes fubfervient to the purpofes of generic difcrimination. This conftitutes the chief merit of his fyftem, which we fhall more fully explain when we come to treat of the natural order of MOSSES. At prefent we fhall defcribe the ftructure of the fringe in each genus.

Phafcum, *Sphagnum*, *Gymnoftomum*, and *Anictangium*, have no fringe at all. In the firft the lid is of one piece with the capfule, and only ruptured irregularly at one fide; in the three others the lid feparates and falls off entire, leaving the margin of the capfule quite naked and beardlefs.—Thefe genera are diftinguifhed from each other by marks derived from other parts of the fructification.

We fhall now firft enumerate fuch genera as are furnifhed with a fimple fringe.

1. *Tetraphis*. Fringe of four teeth. Thefe are erect, acute, firm, polifhed and permanent. Mr. Dickfon firft pointed out to us this fingularity of ftructure in the Linnæan *Mnium pellucidum*, long before the publication of Hedwig's difcoveries. *Botany*.—*Plate Fringes*, *fig*. 1.

2. *Octoblepharum*. Fringe of eight teeth. Capfule without an apophyfis. *Bryum albidum* of Linnæus, an Indian plant.—*Fig*. 2.

3. *Splachnum*. Fringe of 16 teeth, dilated at the bafe, approaching each other in pairs. Capfule cylindrical, ftanding on a flefhy bafe, or *apophyfis*.—*Fig*. 3.

4. *Encalypta*. Fringe of 16 linear upright teeth. Veil ample, bell-fhaped.—*Fig*. 4.

5. *Pterogonium*. Fringe of 16 linear upright teeth. Capfule from a lateral fheath.—*Fig*. 5.

6. *Grimmia*. Fringe of 16 equi-diftant teeth, dilated at the bafe. Veil cylindrical.—*Fig*. 6.

7. *Conoftomum*. Swartz in Schrad. N. Tourn. v. 1. fafc. 3. 24. t. 5, 6. Fringe of 16 tapering teeth, approaching each other in pairs, and all cohering at the points. —*Fig*. 7.

This genus is founded by Dr. Swartz on the *Bryum tetragonum* of Dickfon, (*Grimmia conoftoma*; Engl. Bot. t. 1135. Fl. Brit. 1196), and another fpecies gathered by Mr. Menzies in Staten-land. They are very much alike, and have the habit, as well as the globofe furrowed capfule, of a *Bartramia*; but the fringe is totally different. We cannot but confefs however that the part in queftion offers confiderable violence to nature, in obliging us to feparate thefe two plants from *Bartramia*.

8. *Dicranum*. Fringe of 16 flat, fomewhat inflexed teeth, cloven half way down.—*Fig*. 8.

There is no natural difference of habit between this genus and *Grimmia*.

9. *Trichoftomum*. Fringe of 32 linear ftraightifh teeth, approaching

approaching each other in pairs, sometimes joined in pairs at the base.—*Fig.* 9.

10. *Tortula.* Fringe of numerous linear teeth, spirally and repeatedly twisted together.—*Fig.* 10.

In some species of *Tortula* the teeth are united into a cylinder at the base, pierced with numerous holes, upon which some recent botanists have founded a new genus, called *Syntrichium*; but it seems scarcely necessary, nor even allowable. See *fig.* 11.

The following genera are furnished with a double fringe, some few species of *Orthotrichum*, and one of the *Buxbaumiæ* perhaps excepted.

11. *Orthotrichum.* Capsule terminal. Outer fringe of 16 teeth; inner of 8 or 16 linear ones, sometimes altogether deficient. *Veil* furrowed.

This, though a very natural genus, is variable in its fringe, which differs in different species otherwise nearly akin, but it is the only one so circumstanced. *O. pumilum* has but eight teeth in the outer fringe.—*Fig.* 12.

12. *Neckera.* Capsule from a lateral scaly sheath. Outer fringe of 16 teeth; inner of 16 capillary ones. Veil naked and even.—*Fig.* 13.

13. *Funaria.* Capsule obovate. Outer fringe of 16 oblique teeth, cohering at the points; inner of 16 flat teeth. Veil quadrangular.—*Fig.* 14.

14. *Buxbaumia.* Capsule oblique, gibbous on one side. Outer fringe of 16 very short teeth; inner membranous, plaited.—*Fig.* 15.

In *B. foliosa* the outer fringe is scarcely perceptible. See *fig.* 16.

15. *Bartramia.* Capsule spherical, furrowed. Outer fringe of 16 awl-shaped teeth; inner membranous, laciniated. Lid depressed.—*Fig.* 17.

16. *Mnium.* Capsule terminal, cylindrical, furrowed. Outer fringe of 16 awl-shaped teeth; inner membranous, laciniated.—*Fig.* 18.

17. *Bryum.* Capsule ovate-oblong, smooth. Outer fringe of 16 teeth, dilated at the base; inner membranous, toothed. Flowers terminal.—*Fig.* 19.

18. *Hypnum.* Capsule ovate-oblong, from a lateral scaly sheath. Outer fringe of 16 teeth, dilated at the base; inner membranous, variously toothed. Veil smooth.—*Fig.* 20.

In these four last genera the fringes do not serve us much, the outer one being precisely alike in all, and the inner one, though different in the number and shape of its segments in various species, rather tending by that means to perplex the subject, by leading to unnatural combinations. This is the weakest part of the system of Hedwig, and of those who follow him in making his rules absolute, without regard to natural affinity. Thus out of *Hypnum*, whose inner fringe, for the most part, has 16 principal teeth, with single or double intermediate ones besides, is taken a genus named *Leskea*, in which there is only a simple row of 16 teeth to the inner fringe. This might be allowed, were there any differences of habit or other characters to support the measure, but, on the contrary, it separates species closely akin, and serves only to divide a most natural genus, by a very obscure and difficult character. Weber and Mohr, in their Swedish Tour, suggest another genus founded on *Hypnum dendroides* only, the character of which depends on the inner fringe having 32 teeth, approaching each other in pairs, and moreover meeting by transverse bars, so as to imitate bladders, joined at the summits. It is named *Climacium*, from κλιμαξ, a scale. Whoever is conversant with the varieties of structure in different species of *Hypnum*, will at once perceive the futility of such generic distinctions, in which great pains are taken to render the science not only difficult but unnatural.

19. *Fontinalis.* Capsule enveloped in a lateral scaly sheath. Outer fringe of 16 teeth, dilated at the base; inner reticulated.—*Fig.* 21.

Here the inner fringe comes in aid of the generic character in the happiest manner, being altogether peculiar, and unlike that of any other moss. It consists of a latticed cone, usually, if not invariably, of a fine red colour.

20. *Polytrichum.* Outer fringe of 32 or 64 short, flat, inflexed, teeth; inner a transverse orbicular membrane, affixed to the teeth of the outer. Veil mostly double; the outer hairy.—*Fig.* 22.

Mr. I. D. Sowerby has first noticed a short entire membrane, in the mouth of the capsule of this genus, which we are much inclined to think, with him, is the real inner fringe, that above described being merely the membranous lining of the lid. See *fig.* 23.

We forbear to consider the whole subject of the generic distinctions of Mosses, till we come to them in their proper place, in treating of this natural order. *Andræa* is left out of the above enumeration of genera furnished with a fringe, because the recent observations of Mr. W. I. Hooker, communicated to the Linnæan Society, prove it to have a capsule of four valves, and no real fringe, those valves having been erroneously taken for one of four teeth. S.

FRINGE-*tree.* See CHIONANTHUS.

FRINGE-*tree*, in *Gardening*, a tree of the ornamental kind. See CHIONANTHUS.

FRINGILLA, in *Ornithology*, a genus of passeres, the character of which consists simply in the form of the bill, which is conic, straight, and pointed. The species of the fringilla or finch tribe are rather numerous, amounting altogether to about one hundred, independently of many varieties. The finches are in general birds of small or rather moderate size, and no very inconsiderable portion of them are exclusively natives of extra-European climates. Some are in particular remarkable for the splendour of their plumage.

Species.

LAPPONICA. Head black; body grey and black; eyebrows white; outer tail-feathers with a white wedge-formed spot. Linn. *Fringilla Montana*, Briss. *Le grand Montan*, Buff. *Greater brambling*, Albin. *Lapland finch*, Arct. Zool.

Native of the Northern parts of Europe and America. The species associates in small flocks, runs on the ground like the lark, and has a note resembling that of the linnet. In America it is observed to be very partial to the juniper. The female lays five or six eggs, of a brownish slate colour; the nest is composed of moss and grass lined with feathers.

NIVALIS. Black, beneath snowy; secondary quill and tail-feathers white. Linn. *Pinçon de neige, ou* *Niverolle*, Buff. *Snow-finch*, Lath.

Length seven inches, with the bill black; head and neck above cinereous; back and rump grey-brown; two middle tail-feathers black, the lateral ones white tipped with black. This species inhabits Europe, and is also a native of part of Asia. Pallas describes a variety found about the snowy summits of the Caucasian mountains, in which the flanks are streaked with black; and the two outer-most tail-feathers marked with a white wedge-formed spot.

CASPA. Reddish-grey; face and chin white; wing and tail black, the latter forked. Gmel. *Le Dattier*, Buff. *Caspa sparrow*, Shaw's Travels. *Caspa finch*, Lath.

A gregarious species distinguished for its fine note; this bird

bird inhabits Barbary and Abyssinia, where it is as common near granaries as the common sparrow in Britain; it feeds on the date as well as grain.

Elegans. Above green, with cinereous collar; breast yellow; frontlet, throat, rump, and tail red; abdomen with white lunate spots. Gmel. *Le beau marquet,* Buff. *Beautiful finch,* Lath.

Length five inches, and in bulk resembling the common sparrow; the bill and legs are red; rump and tail chesnut-red. Inhabits Africa.

Formosa. Green; chin and throat yellowish; belly barred with black and white; bill and legs red. Lath. *Lovely finch.*

Native of India, and perhaps differing only in sex from the former.

Noctis. Black; chin and lores rufous; bill black. Linn. *Passer niger,* Briss. *Tohualtototl,* Ray. *Pere noir,* Buff. *Rufous-chinned finch,* Lath.

Size of a sparrow, with the legs black, and the irides red; the species inhabits South America, and the American islands.

Arcuata. Chesnut, beneath white; head and lower part of the neck black; collar and stripe behind the eyes white. Gmel. *Moineau du Cap de Bonne Esperance,* Buff. *Crescent finch,* Lath.

Native of the Cape of Good Hope; the length of this bird is six inches; the lesser wing-coverts are bay, middle ones white at the tip; quill and tail-feathers brown.

Nitens. Steel-blue black; bill and legs flesh-colour. Gmel. *Passer niger erythrorynchos,* Briss. *Passer indicus brachyurus,* Ray. *Moineau du Bresil,* Buff. *Short-tailed Indian sparrow,* Will. *Glossy finch,* Lath.

Rather smaller than the sparrow; the bill flesh-colour, and the irides white. A variety of this species inhabits Carthagena, in South America, the plumage of which is entirely black; the legs and bill dusky. The Nootka finch, which is totally black, with a white bill, is supposed to be likewise a variety.

Leucura. Yellowish, spotted with chesnut, and varied with white lines; beneath and head whitish-yellow; tail-feathers whitish-ash. Gmel. *Passer albicilla bononiensis,* Briss. *White-tailed sparrow,* Aldr.

Inhabits Italy, about Bologna.

Brachyura. Entirely yellowish. Gmel. *Passerculus bononiensis,* Briss. *Passer brachyurus nostras,* Ray. *Short-tailed sparrow,* Will.

The yellow on the breast and belly paler than the rest of the body. The species inhabits with the former.

Cana. Above yellow-brown, beneath yellow; head and chin grey; vent white; wings and tail brown with white lines, Gmel. *Serinus jamaicensis,* Briss. *Serino affinis e cinereo, luteo et fusco varius,* Ray. *Grey-headed finch,* Lath.

Length eight inches; legs blueish, claws brown, short, and hooked.—Inhabits America.

Dalmatica. Above reddish, beneath whitish; tail forked. Gmel. *Passer Sclavonicus,* Briss. *Dalmatic sparrow,* Will.

Larger than the house sparrow, and inhabits Dalmatia.

Bengalus. Pale blue; head and back grey; sides of the head purple. Gmel. *Bengali,* Buff. *Blue-bellied finch,* Lath.

Native of Angola and Bengal. The length is four inches and three quarters; the bill dirty flesh-colour; quill-feathers brown edged with grey; tail pale blue, a little cuneate; legs white. The female is destitute of the purple on the sides of the head, conspicuous in the male.

Flammea. Fuscous; crest flame-coloured; body beneath rosy. Linn. *Fringilla cristata,* Briss. *Flaming finch,* Arct. Zool. *Crimson-crowned finch,* Lath.

Size of the red-pole; the bill pale brown; the whole of the top of the head deep flame-colour, inclining to crimson, and the legs pale brown.

Described by Linnæus from the paintings of Rudbeck, as a native of Norland, and supposed to be peculiar to Northern regions.

Iliaca. Cinereous olive; feathers of the upper part of the body steel-blue, at the base; in the middle olive, with the tip brown; beneath white; tail-feathers and coverts above rufous. Gmel., &c.

Size of a thrush. This species inhabits South America.

Flavirostris. Brown; bill yellowish; feathers on the breast rosy at the tips. Linn. *Fringilla fusca,* Briss. *Le Pinçon brun,* Buff. *Arctic finch,* Arct. Zool.

A migratory species found in Norway and Sweden.

Montifringilla. Base of the wings beneath fine yellow. Gmel. *Fringuello montanino,* Olin. *Pinson d'Ardenne,* Buff. *Bramble, brambling, bramble-finch,* Will. Ray, &c.

Length six inches and a half, and inhabits Europe and Siberia, where it frequents woods, and feeds on the mast of beech and other trees. In the male, the head, neck and back are black, in the female brown; the throat and breast of the male are tawny, inclining to reddish; in the female reddish-grey; the quill-feathers are black, edged with yellow; tail slightly forked, and the legs grey. One variety of this bird has the eye-brows and band on the nape black; body beneath, and rump white; chin and breast red; wing-coverts with a whitish band. Another is distinguished by the paler colour of the plumage, and in having the head white.

Domestica. Quill and tail-feathers brown; body grey and black; wings with a single white band. Linn. Fn. Suec. *Passer domesticus,* Gesn. *Passera nostrale,* Ol. *Moineau franc,* Buff. *House-sparrow,* Donov. Brit. Birds, &c.

This well known species is a general inhabitant of Europe, Africa, and Asia, and from the boldness and familiarity of its habits is most abundant in the vicinity of populous places. It builds under the eaves of thatched houses, and in other similar situations; feeds on seeds and fruits, and also on insects, and lays about five or six eggs, the colour of which is pale-ash with spots of brown.

The principal varieties of this bird are 1st, white; 2d, yellow, clouded above with chesnut; 3d, with the plumage blackish. The colours of the female are more obscure than those of the male.

Cristata. Chesnut, beneath red; crown crested and red; temples black. Gmel. *Friquet huppé, et Moineau de Cayenne,* Buff. *Black-faced finch,* Arct. Zool.

Size of the common sparrow, with the bill red, and legs brown. The upper part of the plumage, wings, and tail reddish brown; rump crimson; sides of the head under the crest black. This bird inhabits Cayenne.

Carolinensis. Reddish brown; belly white; face and pectoral band black; throat and rump scarlet. Lath. *Le Moineau de la Caroline,* Buff. *Carolina black-faced finch.*

Native of Carolina, and from its close affinity to the preceding has been considered as the female of that species by some writers. Its size is rather inferior, the species cristata being six inches and an half in length, the latter only five inches and an half.

Petronia. Grey; eye-brows white; chin pale yellow. Linn.

Linn. *Paſſer torquatus*, Ray. *Paſſer ſylveſtris*, Briſſ. *La ſoulcie*, Buff. *Ring-ſparrow*, Will.

Length five inches and a half; feeds on fruits, ſeeds, and inſects. This ſpecies inhabits the ſouth of Europe. It frequents woods, builds in cavities in the trunks of trees, and lays four or five eggs. The red-headed ſparrow of Albin, and the bird called by Briſſon Paſſer torquatus, are ſuppoſed to be two varieties of F. petronia.

Stulta. Reddiſh-grey ſpotted with ferruginous, beneath yellowiſh; wings with a double white band. Lath. *Paſſer ſtultus*, Briſſ. *Paſſer mattugia*, Olin. *Fooliſh ſparrow*, Will.

Inhabits Italy. Size of the houſe-ſparrow.

Bononiensis. Spotted with white, black, and yellow, beneath yellowiſh white; head white, with pale yellow ſpots; tail-feathers pale yellow. Lath. *Paſſer maculatus*, Ray. *Speckled ſparrow*, Will.

Size of the former, and an inhabitant of the ſame country.

Cœlebs. Limbs black; quill-feathers white on both ſides, the three firſt without ſpots; two of the middle tail-feathers obliquely white. Linn. Fn. Suec. *Fringilla ſylvia*, Scop. *Fringuello*, Olin. *Pinſon*, Buff. *Chaffinch*, Donov. Brit. Birds, &c.

A ſpecies found throughout Europe, in ſome parts of Aſia, and on the coaſts of Africa. The chaffinch is a conſtant inhabitant of the Britiſh iſles, being ſeen at all ſeaſons, and is one of the moſt frequent, as well as beautiful of our feathered tribe. In Sweden and Holland the ſpecies muſt be conſidered of the migratory kind, though it is not unworthy of remark that the females only leave thoſe countries, their males remaining behind. This ſingular migration, which is not entirely peculiar to the chaffinch, takes place in autumn, and at a ſtated period in the enſuing ſpring they conſtantly return to their former haunts.

The chaffinch is eſteemed a bird of ſong; its note is pleaſing, but does not continue throughout the whole year. It builds in low and thickſet buſhes. The neſt is compoſed of the fibres of plants and moſs, with a lining of hair, wool, and feathers. The eggs amount to five or ſix, and are of a pale reddiſh grey, with black ſpots at the larger end. The male is diſtinguiſhed from the female by the ſuperior beauty of its plumage, as well as by having the breaſt and other parts tinged with red.

There are many varieties of this ſpecies, among the principal of which the following may be ſpecified:

1. *Le Pinçon à ailes et queue noires*, Briſſ.; the plumage of which is aſhy above, beneath fleſh-colour; wing-coverts white, in the middle black, with the wings and tail black.
2. *Le pinçon blanc.* Entirely white.
3. *Le pinçon à collier.* Like the common kind, except that the collar and crown are white.
4. *Fringilla anterius alba, poſterius ferruginea*, Gmel. The fore-part white; hind-part ferruginous.
5. *Fringilla ſubtus pallidiſſima, dorſo flavicante*, Gmel. Beneath very pale; back yellowiſh.

Mexicana. Greeniſh-brown, beneath whitiſh. Gmel. *Ligurinus mexicanus*, Briſſ. *Acatechichictli*, Ray. *Mexican ſiſkin*, Lath.

Size of the laſt; this ſpecies is a native of Mexico, and inhabits among reeds.

Cacatototl. Blackiſh and fulvous varied; beneath white. Gmel. *Ligurinus mexicanus niger*, Briſſ. *Cacatototl*, Ray. *Black Mexican ſiſkin*, Lath.

Inhabits Mexico.

Serinus. Somewhat greeniſh; lower mandible whitiſh; back and ſides ſpotted with fuſcous; band on the wing yellow. Linn. *Serinus*, Briſſ. *Serin*, Buff. *Loxia ſerinus*, Scop. *Serin finch*, Lath.

A gregarious ſpecies found in the ſouth of Europe, where it is not uncommon.

Flaveola. Yellow; back greeniſh; front fulvous; quill and tail-feathers black, ſpotted with yellow. Linn. *Saffron-fronted finch*, Lath.

Size of a canary bird, and conjectured to be a mongrel kind produced between the canary bird and goldfinch. The bill is convex, and of a pale colour, with the tip brown; the tail forked and the legs pale. Native place unknown.

Autumnalis. Greeniſh; cap ferruginous; vent teſtaceous. Linn. *Autumnal finch*, Lath.

Native of Surinam.

Lepida. Greeniſh fuſcous; band above and beneath the eyes, with the chin orange; breaſt black. Linn. *Lepid finch*, Lath.

Inhabits woods in the Havannah.

Butyracea. Greeniſh; eye-brows, breaſt, and abdomen yellow; primary quill-feathers white at the outer margin. Linn. *Chloris indica*, Briſſ. *Indian green-finch*, Edwards. *Yellow-finch*, Lath.

Native of Madeira, India, and the Cape of Good Hope.

Bicolor. Head and breaſt black; back, wings, and tail dull greeniſh. Linn. *Chloris bahamenſis*, Briſſ. *Le verdinere*, Buff. *Bahama finch*, Arct. Zool.

A variable ſpecies common in the woods of Bahama. In ſize it agrees with the canary bird. The note is melodious.

Barbata. Pale yellow; wings green, ſpotted with black and red; chin bearded. Molin. Chili.

According to Molina this ſpecies inhabits the mountainous parts of Chili, and deſcends into the plains in winter; it is eaſily tamed, ſings extremely well, and builds in trees. Its ſize is that of the canary bird. The female is without beard, of a cinereous colour, and has the wings marked with a few yellow ſpots.

Amandava. Fuſcous and reddiſh, with white ſpots; tail-feathers black, with a white dot at the tip. Linn. *Fringilla rubra minima*, Klein. *Bengalus punctulatus*, Briſſ. *Le Bengali piqueté*, Buff. *Amaduvade finch*, Will.

This pretty ſpecies is the ſize of a wren. The female differs in having a mixture of white on the throat and fore-part of the neck, and the belly of a pale yellow colour. It inhabits Bengal, Java, and other parts of Aſia. There is a variety of this bird of a brown colour, in which the wings are marked with only a few white ſpots, and another without any ſpots.

Senegala. Ferruginous brown; beneath and crown rufous; bill red, ſtreaked with black. Gmel. *Senegalus ruber*, Briſſ. *Senegal finch*, Lath.

Rather larger than the wren, with tail black, and legs pale grey. It is a native of Senegal, and ſubſiſts chiefly on millet-ſeed; the males ſing well, and the ſong of the females is little inferior to that of the males. The ſpecies bears the climate of Europe extremely well. A ſuppoſed variety of this bird is found in Abyſſinia, the bill of which is purple inſtead of red; the neck and wing-coverts rufous, ſides of the breaſt and wings above ſpotted with white. The female of the latter is entirely brown.

Leucotis. Above duſky, beneath yellow; ears with a white ſpot; primary quill-feathers blue, ſecondary green. Gmel. *White-eared finch*, Oſbeck.

Oſbeck deſcribes, on the authority of ſome Chineſe drawings, ſix analogous kinds of the finch tribe, all which poſſeſs the diſtinctive white ſpot under the ear, which is ſuppoſed

to

to conftitute a material character of the fpecies; and hence it is concluded they muft be varieties of each other. One of thefe has the back and tail purple; another the head green, with the breaft and tail purple; a third the head, back, and wing-coverts purple, and the tail blue; the head and leffer wing-coverts are brown, and the breaft pale green in the fourth; and the fifth is red beneath, with the head, back, tail, and wing-coverts brown; the lower ones fcarlet. Thefe, with the variety firft defcribed, are the fix mentioned by Ofbeck; they are fmall, and inhabit China.

Alario. Head, collar, and breaft deep black; body chefnut, beneath white; four extreme tail-feathers marked with a black line near the tip. Linn. *Pafferculus capitis bonæ fpei*, Briff. *Cape finch*, Lath.

Size of the common fparrow, and in length four inches and a half. This is a native of the Cape of Good Hope.

Maia. Purplifh, with a purple chefnut band on the breaft. Linn. *Cuba finch*, Lath.

The length of this bird is three inches and three quarters. The female is fulvous above, beneath yellowifh, and the bill whitifh inftead of grey, as in the male. In the ifland of Cuba, the native place of this fpecies, the inhabitants call it Maia. It is a gregarious kind, flies in innumerable flocks, and is extremely deftructive to the rice plantations, as befides infects, the rice conftitutes its principal food. The flefh of the Maia is efteemed delicious.

Granatina. Tail wedge-form; body reddifh brown; bill red; temples, rump, and abdomen violet. Linn. *Brafilian finch*, Edwards.

Thefe birds vary in colour, and in being more or lefs fpotted with brown; befides which, there are three or more diftinct varieties, one having the lores fufcous, and the hind part of the body violet; another the lower part of the belly and thighs the fame colour as the body; and a third with the thighs grey-brown; beneath pale tawny, and crown the fame. Birds of this kind with the tail of a reddifh colour are alfo fometimes met with.

The bill of the female, like that of the male, is red; the fpace beneath the eyes rather purple, the top of the head fulvous; back grey-brown; throat and under parts pale fulvous; and lower part of the belly and vent whitifh. This is a beautiful fpecies, of a lively difpofition, and has an agreeable fong. For the latter reafon it is not unfrequently kept in cages by the Europeans in the Brafils.

Fusicollis. Crown, rump, and vent green; back ferruginous; throat brownifh, with a cinereous and reddifh fpot; tail half yellow, half black. Gmel. *Brown-throated finch*, Lath.

Bill red; legs yellow; behind the eyes a white line. This fpecies inhabits China, and is of a fmall fize.

Zeylonica. Yellow; back greenifh; head black; body beneath white, and blackifh varied; quill and tail-feathers blackifh. Gmel. *Ceylon finch*.

A fpecies of fmall fize inhabits China, and alfo Ceylon; there is a variety of this bird, the back of which is green; breaft and belly yellowifh white, and the head brown-red.

Ignita. Shining fufcous red; wings and cuneated tail black. Gmel. *Fire-finch*, Brown.

Inhabits Africa. The fize is that of the linnet, and the female is brownifh, with the front and lores red, and the tail reddifh with the tip dufky.

Tricolor. Black, head and rump blue; fhoulders green; abdomen yellowifh. Linn. *American fparrow of Seba*, Bancroft. *Blue-faced finch*.

Native of Surinam.

Cyanocephala. Red-brown; crown and rump blue; beneath yellow; nape red, orbits white. Gmel. *Blue-crowned finch*, Lath.

Length feven inches. This inhabits Senegal.

Cyanomelas. Blue; frontal line, chin, and dorfal lunule black; quill-feathers fufcous; tail blackifh. Gmel. *Demi-fin noir et bleu*, Buff. *Blue-headed finch*, Lath.

Size of the greater linnet; the bill brown, and legs black. Native place not afcertained.

Diuca. Azure; throat white. Molina.

Inhabits Chili.

Ultramarina. Entirely deep azure; bill white; legs red. Gmel. *L'Outre-mer*, Buff. *Ultramarine finch*, Lath.

Native of Abyffinia; female and young grey.

Abyssinica. Yellow; beneath, and collar black; wings and tail black with yellowifh margins. Gmel. *Le Worabée*, Buff. *Black-collared finch*, Lath.

Size of the canary bird, gregarious, and inhabits Abyffinia.

Syriaca. Fufcous, blackifh and yellow varied; beneath whitifh with dufky fpots; crown red. Gmel. *L'Habefch de Syrie*, Buff. *Tripoline finch*, Lath.

Rather lefs than the linnet. This fpecies inhabits Syria, and is migratory.

Atra. Blackifh, breaft and rump pale afh. Gmel. *Fringilla obfcura*, Lath. Ind. Orn. *La Linotte brune*, Buff. *Dufky finch*, Edwards.

Length four inches, the bill afh colour, legs dufky, and the feathers throughout paleft at the tips. The fpecies is fuppofed to inhabit Angola.

Angolensis. Brownifh-afh, with fufcous fpots, beneath chefnut; frontlet and chin black; cheeks and throat fpotted with white; rump pale yellow. Gmel. *Lniaria Angolenfis*, Briff. *Vengoline*, Buff. *Angola finch*, Lath.

Size of the common linnet; the bill brown, and the legs flefh colour; the upper part of the plumage in the female is reddifh brown, beneath reddifh, with a fufcous band extending from the bafe of the bill to the back part of the head. In Angola the male is called by the natives Negral, and the female Benguelinha. The fpecies is remarkable for its melodious fong, which is even faid to furpafs that of any other extra-European bird, the American mocking-bird excepted.

Bengalus. Pale azure; head and back grey; fides of the head purple. Linn. *Fringilla Benghalus*, Lath. Ind. Orn. *Le Bengali*, Buff. *Blue-bellied finch*, Edwards.

The female differs from the male in wanting the red fpot beneath the eyes, in other refpects they nearly agree. The fpecies inhabits Bengal and alfo Angola. Its length is about four inches and a half; the bill dirty flefh-colour; quill-feathers brown edged with grey; tail pale blue, rather wedge-form and the legs whitifh. There is a variety of this fpecies with the back brown, and the belly and tail blue.

Carduelis. Quill-feathers black, in the middle yellow, with the two outer black; two extreme tail-feathers white in the middle, the reft white at the tips. Linn. Fn. Suec. *Carduelis*, Gefner. *Cardello*, Olina. *Chardonneret*, Buff. *Goldfinch, or thiftle-finch*, Will. Albin. Donov. Brit. Birds.

The goldfinch is a general inhabitant of Europe, and a confiderable part of Afia and Africa, and a variety of it at leaft is found even in the American iflands. This beautiful and well known fpecies conftructs its neft of fine mofs intermingled with lichens, the down of thiftles and other plants, and lines the interior with hair and wool; the eggs are five in number, of a white colour, marked with deep purple at the larger end. It often builds in orchards, and has commonly

monly two broods in a year. The goldfinch is obferved to abound moft in thofe places where thiftles occur in the greateft plenty, and hence it was called by early Englifh writers the thiftle finch. The feeds of the thiftle is a favourite food with this bird; it will alfo feed on hemp and other feeds as well as fruit and infects. The fpecies is remarkable for the docility of its difpofition, and as it fings charmingly, it is frequently kept in cages. The male differs from the female chiefly in the fuperior ftrength and beauty of its colours. The varieties of the goldfinch are altogether numerous, among which the following are confidered the moft permanent:

1. *Carduelis leucocephalos*, Briff. *Chardonneret à tête blanche*, Buff. *White-headed goldfinch*, Will. In this the region of the bill and eyes are fnowy.

2. *Carduelis capite ftriato*, Briff. *Chardonneret à tête rayée*, Buff. *Goldfinch*, Brown, Jamaica. Having the head ftreaked with red or yellow.

3. *Carduelis melanocephalos*, Briff. *Chardonneret à tête noire*, Buff. The head black; fometimes the neck of this kind is alfo black, and the bill fpotted at the bafe with red.

4. *Carduelis albida*, Briff. *Chardonneret blanchâtre*, Buff. *Whitifh goldfinch*, Will. A variety of a whitifh colour, with the front, cheeks, and chin red; and the wings and tail brownifh-afh.

5. *Carduelis nigra*, Briff. *Chardonneret noir*, Buff. Entirely black.

The plumage of the goldfinch, like that of the lark and fome other fmall birds, becomes black from the bird feeding on hemp feed, a fact extremely well authenticated by the experiments of modern ornithologifts.

6. *Carduelis nigra icterocephalos*, Briff. *Carduelis congener*, Ray. *Chardonneret noir à tête jaune*, Buff. *A bird of kin to the goldfinch*, Will. This is rather larger than the common goldfinch; the bill furrounded with a faffron-coloured ring, the reft of the head and upper parts dark.

7. *Carduelis hybrida*, Briff. *Chardonneret métis*, Buff. *Canary goldfinch*, Albin. Like the former this exceeds the common goldfinch in magnitude; the colours on the head are fimilar to the ordinary kind, but more obfcure; the upper parts of the body yellowifh-brown; under parts yellow; wings as in the goldfinch, and the tail yellow with the tip black. This is the hybrid between the goldfinch and canary.

8. *Le Chardonneret blanc*, Briff. A variety wholly white. Sometimes the white variety has the outer edge of the quills tinged with yellow, or a little mixture of yellow on the wing-coverts. In others thofe parts of the plumage which in the common bird are red, exhibit a faint blufh or tint of that colour; or are more or lefs mottled with red.

Cannabina. Chefnut-brown, beneath reddifh-white; wings with a longitudinal white band; fpot on the crown and breaft red. Linn. *Linaria marina*, Aldr. *Grande linotte de vignes*, Buff. *Greater red-headed linnet*, Ray. *Greater red-pole*, Arct. Zool.

This pretty bird is an inhabitant of Europe and America; its fize is rather lefs than that of the common linnet, and its length nearly the fame. The head of the female is afh-coloured, fpotted with black, the back and fcapulars of a reddifh-brown, the breaft and fides dirty yellow, ftreaked with dufky lines.

Linaria. Brown, varied with grey; beneath reddifh-white; wings with a double white band; crown and breaft red. Gmel. *Leffer redpole.*

Numerous throughout Europe. The fize is confiderably lefs than that of the greater red-pole: the bill and legs brown; the back black; fides marked with narrow dufky lines, and the legs dufky. The female has a fpot of faffron on the front.

Linota. Chefnut-brown, beneath whitifh; wings with a longitudinal white band; tail-feathers each fide edged with white. Gmel. *Common linnet.*

Size of the laft. The bill is grey with the tip brown; fides of the neck cinereous; throat with a brown line in the middle, bounded on each fide with a white one; bottom of the breaft blood red; vent yellowifh, with the two middle tail-feathers edged with red. In the female and young birds the red is wanting on the breaft. This fpecies inhabits Europe, and feeds principally on hemp feed, which it peels before it eats.

The linnet is common in England, and is often kept in cages, being in high efteem for the fweetnefs of its fong. It alfo breeds in this country. The neft, which is compofed of dried herbs, grafs, and mofs, and lined with hair and wool, is ufually built in thickets of black and white thorn, or in a furze bufh. The female lays from four to five white eggs, fpotted with reddifh-brown at the larger end. Linnets are frequently found in flocks during winter, and when in want of food will eat any kind of feed, though they prefer the hemp feed. Linnets are fometimes met with entirely of a white colour, and there is befides another variety which has the quills and tail black, edged with white.

Canaria. Bill and body ftraw-colour; quill and tail-feathers greenifh. Linn. *Le Serin des Canaries*, Briff. *Canary bird*, Will.

In a wild ftate the canary bird is, as the name implies, an inhabitant of the Canary iflands; and is alfo found in other places, as Palma, Cape Verd, Fayal, and Madeira, where it frequents watery places, and feeds on feeds, efpecially thofe of the hemp and canary-grafs. The delightful fong of the canary bird is familiar to every one. They are caught in vaft numbers, and tranfported from their native climate to different parts of Europe, where they bear the confinement of the cage remarkably well, and not only thrive, but breed with perfect facility.

The canary bird, befides becoming productive with its own fpecies in European climates, will breed pretty freely with the fifkin and the goldfinch, and alfo with the linnet, the yellow-hammer, and chaffinch, and even the houfe-fparrow. The male canary bird will not affimilate with the females of thofe birds, the hen muft be of the canary kind to produce this union; the young obtained from croffing the breeds are in general mules, though the contrary does fometimes happen.

An enumeration of the many varieties of thefe birds that are to be found in a ftate of domeftication, would be altogether tedious; we may briefly obferve that in a ftate of nature the prevailing colour of the plumage is grey, and that by various means of culture, and pairing them with other fpecies, the varieties are at leaft as numerous as thofe of our common poultry. Buffon particularly defcribes twenty-nine diftinct varieties, and there are many others which he has entirely omitted.

It is a long-lived bird, attaining to the age of ten or fifteen years, or, according to Salerne, even as far as eighteen.

Macroura. Body fufcous, with blackifh fpots, beneath pale cinereous, tail wedge-formed and elongated, the two middle tail-feathers narrow, pointed, and greenifh-brown. Gmel. *Long-tailed finch*, Lath.

From Cayenne. In fize agrees with the linnet; length feven inches and a half, the legs and bill brown.

Argentoratensis. Fufcous, beneath rufous, fpotted with

with fuſcous, belly and vent whitiſh. Gmel. *Linaria argentoratenſis*, Briſſ. *Le Gyntel de Straſburg*, Buff. *Straſburgh finch*, Lath.

Size of the common linnet. Inhabits the environs of Straſburgh, where it is called Gyntel. The quills and tail are brown, the legs reddiſh.

CAUDACUTA. Varied with rufous and brown; eye-brows, chin, and neck above rufous; tail entire, the feathers all pointed at the tips. Lath. Ind. Orn.

Inhabits the interior of Georgia in America. The length of this bird is four inches and a half, the bill and legs pale; irides fuſcous.

GEORGIANA. Fuſcous, beneath whitiſh; leſſer wing-coverts entirely, with the edges of the outer webs of the tail-feathers, rufous; chin and throat mouſe-coloured; beneath the arm-pits a black ſtreak. Lath. Ind. Orn.

About ſix inches in length; the bill duſky, irides fuſcous; head fuſcous, the back blackiſh in the middle; legs fuſcous. This ſpecies inhabits the ſame country as the former.

MELANICTERA. Black; abdomen ſpotted with white; wings and tail edged with ferruginous. Gmel. *Moineau de Macao*, Buff. *Black and orange finch*, Lath.

Size of a linnet. The ſpecies inhabits Macao.

MELANOLEUCA. Black, with a white pectoral band. Gmel. *Moineau de Java*, Buff. *White-breaſted finch*, Lath.

Found in Java, and inhabits ſame country as the laſt.

PECORIS. Fuſcous, beneath paler; tail ſomewhat forked. Gmel. *Fringilla virginiana*, Briſſ. *Brunet*, Buff. *Cowpen bird*, Cateſby. *Cowpen finch*, Lath.

Native of Virginia and Carolina. Length ſix inches and three quarters.

JAMAICA. Grey; breaſt blueiſh-green; quill and tail-feathers black. Linn. *Le Bonana*, Buff. *Paſſer cæruleo-fuſcus*, Ray. *Grey groſbeak*, Brown. *Bonana finch*, Lath.

Size of the ſiſkin, with bill and legs black. Native of Jamaica.

CANA. Yellow-brown, beneath pale yellow; head and chin grey; wing and tail-feathers fuſcous, with white lines. Gmel. *Serinus jamaicenſis*, Briſſ. *Grey-headed finch*, Lath.

Inhabits Jamaica. Length eight inches; legs blueiſh.

SAVANNARUM. Above brown, varied with whitiſh and pale yellow; beneath yellowiſh-brown; belly and tip of the quill-feathers white; wings and tail brown; eye-brows yellow. Gmel. *Paſſer jamaicenſis*, Briſſ. *Paſſer pratorum*, Klein. *Savanna bird*, Ray. *Savanna finch*, Lath.

Native of Jamaica. The length of this bird is four inches and a quarter; the bill ſhort, thick, and pointed, and the legs whitiſh. Sloane relates, that "they ſit on the ground in the plains, and run thereon after the manner of ſkylarks, as low as they can to avoid being diſcovered, and when raiſed, fly not far nor high, but light again very near."

COCCINEA. Fulvous ſcarlet; wings and tail black; quill-feathers orange at the outer edge, the primaries black at the tips. Gmel. *Scarlet finch*, Lath.

Length four inches; the bill pointed, and of a pale colour; tail even at the end; legs black.

ROSEA. Roſy; frontlet ſilvery; back with browniſh-grey ſtripes; wings and tail blackiſh; tail-feathers roſy on the outer edge. Gmel. *Fringilla roſea*, Pallas. *Roſy finch*.

A rare ſpecies found among the willows in Siberia. There is a variety of this kind found likewiſe in Siberia, the plumage of which is reddiſh-aſh above, beneath white; the feathers of the head, rump, and throat tipped with fine red; quill and tail-feathers brown, edged with pale yellow. This is the crimſon-crowned finch of the Arctic Zoology. The loxia erythrina of Gmelin is conſidered by Dr. Latham as a variety alſo; its colour is reddiſh cinereous above, beneath white, with the head, rump, chin-feathers red at the tip; lower part of the neck whitiſh; and the tail, which is rather forked, with brown ſhafts, and pale yellow margins. This laſt-mentioned bird inhabits the thick woods about the Volga and Samara, where it is ſaid to breed. The female makes a neſt of hay between the branches of trees.

PUNICEA. Black; cheeks, throat, and breaſt red; wing-coverts with two white lines. Gmel. *Red-breaſted finch*. Arct. Zool.

Native of America.

FERRUGINEA. Fuſcous, with ferruginous margins, beneath pale; breaſts with duſky ſpots; region of the eye white. Gmel. *Little ſparrow*, Edwards. *Ferruginous finch*, Arct. Zool.

Size of the common ſparrow, and inhabits Pennſylvania.

ALBICOLLIS. Cheſnut, beneath hoary; chin white; cheeks hoary; eye-brows orange. Gmel. *Fringilla Penſylvanica*, Lath.

Length ſix inches and a quarter. Inhabits ſame country as the former.

FASCIATA. Spotted, above ferruginous, beneath white; tail fuſcous, with numerous blackiſh bands. Gmel. *Faſciated finch*, Arct. Zool.

Native of New York.

GRAMINEA. Varied with ferruginous, cinereous and black; beneath white; breaſt and ſides ſpotted; throat ſtriated; tail, and primary quill-feathers blackiſh; leſſer wing-coverts bay. Gmel. *Graſs finch*, Arct. Zool.

Inhabits with the former, and lays its eggs in the graſs.

PINETORUM. Above reddiſh, teſtaceous, beneath yellow; breaſt with a tranſverſe ferruginous band. Lepechin.

A ſpecies found in the pine foreſts of Siberia.

CINEREA. Fuſcous with ferruginous margin; two lateral lines on the head with the chin grey; throat greyiſh; abdomen white in the middle. Gmel. *Cinereous finch*, Arct. Zool.

Native of Aoonalaſhka.

ZENA. Black, beneath white; above and beneath the eye a white line; breaſt orange. Linn. *Fringilla bahamenſis*, Briſſ. *Le Pinçon à tête noir et blanche*, Buff. *Bahama finch*, Cateſby. *Orange finch*, Arct. Zool.

The bill and legs are lead colour; wings and tail brown, and the wing-coverts marked with a white band. The female has the head and neck cinereous. This ſpecies inhabits South America. Its length ſix inches and a quarter.

SYLVATICA. Head banded; body above grey and black varied; breaſt and belly hoary. Lepechin. *Wood-finch*.

Inhabits the pine foreſts of Siberia.

NORTONIENSIS. Black, beneath white; throat ſpotted with ferruginous; quill-feathers and tail black, the outer

feathers on each side the latter with a white longitudinal line. Gmel. *Norton finch*, Arct. Zool.

Found in Norton Sound.

Hyemalis. Fuscous, clouded with black, beneath white; lower part of the neck, breast, and sides spotted with brown. Gmel. *Winter finch*, Arct. Zool.

Inhabits New York during the winter season.

Striata. Clouded with fuscous; head with four black streaks; face yellow; temples whitish; wing-coverts and sub-cuneated tail brown; wings blackish. Gmel. *Striped-headed finch*, Arct. Zool.

Inhabits with the last, and measures in length five inches and a half.

Purpurea. Sub-violaceous; belly white; quill-feathers brown on the inner webs. Gmel.

Size of the last. This kind inhabits Carolina, and feeds on the juniper berries and the buds of fruit-trees. The tail is slightly forked, the female fuscous, and having the belly spotted with white.

Surinama. Grey; quill-feathers each side and lateral tail-feathers within white, Linn. *La linotte de Surinam*, Ferm. *Surinam finch*, Lath.

Native of Surinam. Its size rather exceeds that of our common sparrow, its note is indifferent, but the flesh is in much esteem.

Longirostris. Grey, varied with brown and yellow; beneath orange; tail olive, head and chin black, with chesnut collar. Gmel. *Le Pinçon a long bec*, Buff. *Long-billed finch*, Lath.

Remarkable for the length of its bill; the species is larger than the chaffinch, and inhabits Senegal.

Sinica. Rufous olive, beneath testaceous; quill and tail-feathers black, with the base pale yellow. Linn. *L'Olivette*, Buff. *Pinçon de la chine*, Pl. Enl. *Chinese finch*, Lath.

Native of China, and in size resembles the linnet.

Sinensis. Olive, beneath yellow: head, bill, legs, and quill-feathers black, the greater quill and tail-feathers half yellow. Gmel. *Le Tarrain de la Chine*, Sonnerat. *Chinese siskin*, Lath. *Fringilla asiatica*, ibid

Inhabits with the preceding.

Nævia. Cinereous with obscure spots, beneath cinereous; chin white; lores rufous; on the jaw a black streak. Gmel. *White-cheeked finch*, Lath.

Size of the common sparrow; and is an African species, found chiefly at the Cape of Good Hope.

Melanocephala. Ferruginous brown; head, throat and quill-feathers black; nape and abdomen white, with the bill red. Gmel. *Black-headed finch*, Lath.

Native of China.

Fusca. Brown, with the margins of the feathers blackish; beneath brown-white. Gmel. *Brown finch*, Lath.

Inhabits same country as the preceding.

Eustachii. Yellow, beneath orange; spot beneath the eye blue; wings and tail red. Gmel. *Fringilla insulæ S. Eustachii*, Briss. *Le pinçon jaune et rouge*, Buff. *Passer Africanus eximius*, Seba. *Eustachian finch*, Lath.

Native of the island of St. Eustatia. Length five inches and a half.

Variegata. Red, yellow, blue, and white, varied; breast pale-yellow, clouded; tail at the tip and margin white. Gmel. *Le Touite*, Buff. *Variegated finch*, Lath.

Size of the last; the bill yellow, and legs red. The species inhabits New Spain.

Crispa. Olive, beneath pale yellow; head black; many of the feathers recurvate. Linn. *Le Pinçon frisé*, Buff. *Black and yellow frizzed sparrow*, Edwards. *Frizzled finch*, Lath.

Inhabits Africa.

Indica. Cinereous fuscous, beneath rufous white; frontlet, throat, collar and neck white; pectoral band with the wings and tail black. Gmel. *Fringilla torquata indica*, Briss. *Le Pinçon à double collier*, Buff. *Collared finch*, Edwards.

Native of India.

Melba. Green; face and tail red, abdomen undulated with black and white. Linn. *Carduelis viridis*, Briss. *Maracaxao*, Buff. *Green finch*, Edwards.

Size of the goldfinch; the bill is flesh colour; lores blueish; and tail entire. The female is distinguished by having the bill pale yellow; top of the head and neck ash-colour, and the base of the wings and rump yellowish. Linnæus describes it as a native of China.

Afra. Fuscous-green; cheeks pale crimson; tail scarlet; primary quill-feathers dusky, with orange margins. Gmel. *Red-faced finch*, Brown.

Inhabits Angola.

Psittacea. Green; face, rump, and tail scarlet; inner edge of the quill-feathers brown. Gmel. *Parrot finch*, Lath.

A beautiful species, rather less than the wax-bill; it inhabits New Caledonia.

Erythrocephala. Olive; head and collar scarlet, with black orbits; wings black with two bars of white on the coverts. Gmel. *Red-headed finch*, Brown.

Inhabits Mauritius.

Lulensis. Fuscous; breast and shoulders rufous; wings black with a rufous spot; collar and body beneath white. Linn. *Carduelis suecica*, Briss. *Le Chardonneret à quatre races*, Buff. *Lulean finch*, Arct. Zool.

Native of Sweden, chiefly about West Bothnia, and in size corresponds with the goldfinch.

Tristis. Yellow; front black; wings fuscous. Linn. *Carduelis americana*, Briss. *Le Chardonneret jaune*, Buff. *American goldfinch*, Arct. Zool. *Green sparrow*, Bancroft.

Length four inches and a half, with the bill and legs white, the female dusky and destitute of the black on the head. They inhabit New York during the summer season, and feed on thistles. The bird called by Buffon le tarin de la Nouvelle Yorck is supposed to be a variety of this species, or the same in its winter dress.

Spinus. Quill-feathers pale yellow in the middle, the first four without spots; tail-feathers yellow at the base, and tipped with black. Linn. Fn. Suec. *Acanthus avicula*, Gesner. *Ligurinus*, Briss. *Lucarino*, Ol. *Abadavine*, Albin. *Siskin*, Donov. Br. Birds.

Picta. Purplish; crown, wings, and tail blue; rump yellow; collar, breast, and vent red. Gmel. *Azure-headed finch*, Lath.

Described by Dr. Latham from a Chinese drawing in the possession of Dr. Fothergill. The length is four inches, the bill and legs red, and the greater wing-coverts green.

Torquata. Reddish; rump blue; lunule on the cheeks black; quill-feathers black with the tips blue, and a white spot at the extremity. Gmel. *Lunar finch*, Lath.

Native of India. Length six inches.

Multicolor. Black, beneath yellowish; vent yellow; cheeks yellowish; lower part of the back green; wing-coverts with a white spot; secondary quill-feathers with white lines near the tip. Gmel. *Green-rumped finch*.

Inhabits Ceylon.

Testacea. Testaceous brown clouded with black; quill-feathers

quill-feathers and tail fuſcous; bill and legs fleſh colour. Jacquin. *Teſtaceous finch.*

Length five inches and a half, and ſuppoſed to inhabit Luſitania.

Flavicollis. Cinereous, beneath whitiſh; chin white; throat with a yellowiſh ſpot; primary quill-feathers black, edged with brown; bill and legs blueiſh-grey. Gmel. *Yellow-throated finch*, Arct. Zool.

Native of North America.

Carthaginiensis. Entirely cinereous with fuſcous and yellow ſpots; bill and legs pale fuſcous. Jacquin. *Carthagena finch.*

Size of the canary bird. The ſpecies inhabits South America, and in ſong reſembles the chaffinch.

Ochracea. White; head, ſides of the neck, breaſt, and wing-coverts ochre colour; bill and legs yellow. Jacquin. *Ochre finch.*

Inhabits Auſtria. Size that of the chaffinch.

Imperialis. Ruſty-roſy; crown, and beneath yellow; quill-feathers and tail ſhort and obſcure. Lath. *Imperial finch.*

Size of the Amaduvade; bill and legs fleſh-colour; inhabits China.

Australis. Fuſcous; collar ferruginous. Lath. *Ruſty collared finch.*

Inhabits the iſle of Terra del Fuego.

FRINGILLAGO, a name by which ſome have called the whole genus of the titmouſe; but others have reſtrained it only to one ſpecies of them, which is the common larger kind, called by us the ox-eye. See Parus *major.*

Fringillago *Americana cærulea*, a name given by Mr. Ray to the American titmouſe, otherwiſe known by its Braſilian name *guiragenoia*. See Tanagru *braſilienſis.*

FRINGILLARIUS, Accipiter, the name of a ſpecies of hawk, called by ſome *niſus*, and in Engliſh the ſparrow-hawk. See Falco *Niſus.*

FRINGYBAZAR, in *Geography*, a town of Hindooſtan; 11 miles S.S.E. of Dacca.

FRINGYPAT, a town of Hindooſtan, in Canara; ſix miles E. of Mangalore.

FRIO, a river of Spain, which riſes in Grenada, and runs into the ſea at Toros.

Frio, a ſmall iſland on the coaſt of the Brazils, ſituated in S. lat. 32° 2′. and in W. long. 41° 31′ 45″. The land is high, with a hollow in the middle, which makes it appear at a diſtance like two ſeparate iſlands. The paſſage between the iſland and the continent is about a mile broad, and ſeemed to ſir Eraſmus Gower to be clear of ſhoals.

FRIPPERY, a French term, ſometimes uſed in our language; properly importing the trade, or traffick of old ſecond-hand cloaths and goods.

The word is alſo uſed for the place where ſuch ſort of commerce is carried on, and even for the commodities themſelves. The company of Frippiers, or Fripperers, at Paris, form a regular corporation, of an ancient ſtanding, and make a conſiderable figure among the companies of that city.

FRISAWA, in *Geography*, a river of Moravia, which runs into the Marſch, five miles N. of Maglitz.

FRISCH, John Leonard, in *Biography*, was born at Sulztach, in the Upper Palatinate, in 1666. He ſtudied at various univerſities in Germany, and after travelling through France and Switzerland, he ſucceeded the evangelical preacher, Elias Breithorn, at Newſol in Hungary, but was driven from thence by perſecution, and became an interpreter during the Turkiſh war. From Hungary he went to Venice and other parts of Italy, and was in 1693 appointed ſuperintendant of a nobleman's eſtate near Nuremberg. After this he went firſt to Holland, and then to Berlin, where he was appointed ſub-rector, and then rector of the Grey Convent Gymnaſium in 1726. By the recommendation of the celebrated Leibnitz, whom he inſtructed in the Ruſſian language, he was choſen a member of the Royal Academy of Sciences, and of the Imperial Academy of the Searches into Nature. He had already perpetuated his name by being the founder of the ſilk manufactory at Brandenburg, and he was the firſt perſon who cultivated mulberry-trees in the neighbourhood of Berlin, where he formed a plantation of them, which flouriſhed to a very great degree. He conceived an idea that church-yards, in the city and adjacent villages, might be planted with theſe trees to great advantage, and the plan was recommended in the year 1718 by Frederic William I. He was author of a German dictionary, and wrote a deſcription of all the inſects of Germany, of which thirteen parts were publiſhed. Theſe have been of no ſmall uſe to ſucceeding naturaliſts. He was author of many other works, among theſe was one entitled, "A Repreſentation of the birds of Germany, with a few of foreign countries, coloured after nature." This was finiſhed, and publiſhed by Friſch's ſon, and is eſteemed by naturaliſts on account of the great accuracy of the colouring. It contains twelve grand claſſes, which occupy 255 plates, and 179 pages of deſcription; of theſe Friſch wrote the deſcription of the four firſt claſſes only. Gen. Biog.

Frischi *Haff*, in *Geography*, a gulf or arm of the ſea, on the coaſt of Pomerania, S. of the Baltic; about 25 miles in length from eaſt to weſt, and eight from north to ſouth. The Oder paſſes through it at its eaſtern extremity.—Alſo, a bay or arm of the ſea, between Konigſberg and Elbing, ſeparated from the Baltic by a tongue of land, called "Friſen Nerung," 26 miles long, and ſcarcely two wide. The bay is about 54 miles in length, and hardly ſix in breadth. It communicates with the Baltic by a narrow paſſage near Pillau.

FRISCHBACH Allen, a mountain of Stiria; 10 miles E. of Pruck.

FRISCHLIN, Nicodemus, in *Biography*, a learned German, was born in the duchy of Wirtemberg in 1547. He was educated partly under his father, and partly at the univerſity of Tubingen, and at the latter place he taught the belles lettres, and other ſubjects relating to polite literature. He profeſſed to teach the principles of grammar in a new and eaſy method, and publiſhed ſtrictures upon former grammarians, in a work entitled "Strigil Grammatica," which involved him in ſome angry controverſies with others of the profeſſion. In a commentary, which he publiſhed on the Bucolics and Georgics of Virgil, he indulged ſuch acrimony of ſtyle in declaiming upon the compariſon between the innocence of a country life, and the corrupt manners of the great, that he was compelled to quit his native country, and wander through the different parts of Germany. At Mentz he wrote to the duke of Wirtemberg for pecuniary aſſiſtance, of which he ſtood in great need, but being diſappointed in his application, he wrote back a remonſtrance ſo full of abuſe, that he was arreſted, and carried to the priſon of Aurach, in the duchy. Attempting to eſcape from this place by cutting his ſheets into ſlips, and thus to let himſelf down from the window, his weight broke the ſupport, and he was unfortunately killed by the fall. This happened in November 1590, when he was forty-three years old. He had a wonderful facility in making verſes, and wrote 16 books of elegies, ſeven comedies, two tragedies, and a multitude of anagrams, odes, &c. From the emperor Rodolph he obtained the golden laurel, and the title of "Crowned Poet."

He

He left commentaries upon the epiftles of Horace, and the fatires of Perfius, and tranflations of Oppian, Ariftophanes, Callimachus, and Heliodorus. Moreri.

FRISCHLING, in *Geography*, a river of Pruffia, which rifes about 10 miles N. of Pruifch Eglau, and runs into the Frifch Haff; two miles S. W. of Brandenburg.

FRISNIK, a town of Moravia, in the circle of Iglau; four miles S.S.E. of Iglau.

FRISONS, or Frisians, in *Ancient Geography*, ancient inhabitants of the country which ftill bears their name; between the Amafia or Ems, and the Rhine. To the eaft they had the Chauci, Chamari, and Angrivari, from whom they were feparated by the Amafia; to the weft, the Rhine; to the fouth, the Bructeri; and to the north, the ocean. But in the decline of the Roman empire, their name and dominion extended from the Cimbric Cherfonefus to the Scheldt; their limits being variable according to the circumftances of the times. They were diftinguifhed into the Upper and Lower Frifons; the former being divided, as we have faid, from the Lower Chauci by the Amafia, and from each other they were divided by an arm of the Rhine. Their country ftill retains the name of Friefland, and is divided into eaft and weft; but the latter has been difmembered from Germany, and conftituted one of the feven United Provinces. See Friesland.

In order to account for the extenfion of their dominion, it fhould be recollected, that when the Roman power declined in Gaul and the Barbarians encroached on its limits, the maritime people of Germania Secunda, whofe fidelity to the Romans had rendered them odious to thofe nations who inhabited the other fide of the Rhine, re-united for their defence. With this view they chofe a general, to whom they gave the command of their combined troops, but they maintained their own laws and cuftoms, and the particular form of their government. The Frifons, being the moft powerful, gave their own name to this league. In procefs of time they were joined by the Saxons, who participated of this honour, and the two names were for fome time fynonymous. Accordingly, under the appellation of Frifons many people of lefs note, but of appropriate denominations, were comprehended; and this appellation was given to their whole country. The Frifons were fimple and ingenuous; but eminently courageous; they loved liberty and recurred to arms in order to defend it. So jealous were they of their freedom and independence, that in order to guard againft the intrufion of ftrangers, they caufed them to articulate certain words, peculiar to themfelves; and if they were unable to do this, they were precipitated into the marfhes. The Frifons were for a long time, as it is faid, governed by kings. Drufus having paffed the Rhine, conquered Frifia, and the inhabitants became his allies and refcued him from danger incurred by his attack on the Cauci. Drufus impofed upon them an eafy tribute, which confifted merely of fome oxhides for the foldiers' bucklers and machines of war. This tribute they contentedly paid till Olennius, firft centurion of a legion under Tiberius, having been appointed governor of Frifia, infifted that the hides of wild bulls fhould be the models of thofe of the tribute. This was impofing upon impracticable conditions, as the wild beafts in the German forefts were very large, and their cattle very fmall. Finding it impoffible to obey this new law, they firft parted with their herds, then with their lands, and at laft furrendered their wives and children to bondage, in payment of the rigorous exaction. When their remonftrances were fruitlefs, they had recourfe to arms, and hung upon trees the foldiers who levied the tribute. Olennius made his efcape, and the Frifians purfued him; but by the whole force of the 5th legion fent out againft them, they were at length repulfed. They remained, however, in arms for 20 years, till Corbulo, A.D. 47, conftrained them to fubmit peaceably to the Roman yoke, to give hoftages, and to reftrain themfelves within the limits of the territory, which he affigned them. He prefcribed their form of government, made their laws, gave them a fenate and magiftrates, and to keep them perfectly in fear, he built a fort in the middle of their country, and ftrongly garrifoned it. In the reign of Nero, the Frifons took with them their wives and children to fettle on the lands near the Rhine, which the Romans had referved for their foldiers and left uncultivated. They built huts, fowed the ground, and ufed thefe lands as if they had been their own; but they were made to underftand that the Romans would fall upon them, if they did not return to their old places of abode, or obtain the emperor's leave to fettle there. The Frifians, not being able to conceive how any one could be jealous of the poffeffion of a country which was applied to no ufe, agreed to apply to the emperor. Two of their magiftrates were fent to Rome; and though they were treated with refpect by the emperor, their requeft was denied. The Frifons were obliged to leave the lands which they had occupied; and on their refufing to obey, foreign troops were fent who compelled them by force, and killed or made prifoners thofe who perfifted in their obftinacy. We have already mentioned other particulars relating to this people under the article Friesland, to which we refer.

FRIST, a term among *Merchants* for felling goods upon credit.

FRIT, or Fritt, in the *Glafs Manufacture*, is the matter, or ingredients, whereof glafs is to be made; when they have been calcined, or baked in a furnace.

A falt drawn from the afhes of the plant kali, or from fern, or other plants mixed with fand, or flint, and baked together, makes an opake mafs, called by glafs-men frit; probably from the Italian *frittare*, to fry; or becaufe the frit, when melted, runs into lumps, like fritters, called by the Italians *fritelli*.

Frit, by the ancients, was called *hammonitrum*, or *ammonitrum*, of ἄμμος, *fand*, and νιτρον, *nitre*: under which name it is defcribed by Pliny thus: fine fand from the Volturnian fea, mixed with three times the quantity of nitre, and melted, makes a mafs called ammonitrum; which being re-baked, makes a pure glafs. Hift. Nat. lib. xxxvi. cap. 26.

Frit, Neri obferves, is only the calx of the materials which make glafs; which though they might be melted, and glafs be made, without thus calcining them, yet it would take up much more time. This calcining, or making, of frit, ferves to mix and incorporate the materials together, and to evaporate all the fuperfluous humidity. The frit, once made, is readily fufed, and turned into glafs.

There are three kinds of frits; the firft, *cryftal* frit, or that for cryftal-metal; made with falt of pulverine and fand.

The fecond, and ordinary frit, is made of the bare afhes of pulverine, or barilla, without extracting the falt from them. This makes the ordinary white, or cryftal metal.

The third is frit for green glaffes, made of common afhes, without any preparation. This laft frit will require ten or twelve hours baking.

The materials in each are to be finely powdered, wafhed and fearced; then equally mixed, and frequently ftirred together in the melting pot. For the reft, fee Glass, and Crystal.

FRITBURG. See Friburgh.

FRITH, John, in *Biography*, one of the earliest English martyrs to the principles of the Reformation, was born at Seven-oaks, in Kent, about the beginning of the sixteenth century. He received his college education at King's college, Cambridge. Here he distinguished himself by his application and proficiency, and when he was admitted to the degree of B. A. he had a high reputation as a first rate linguist, and well-informed general scholar. On this account he was made one of the junior canons of the New Institution, now Christ-church, in the university of Oxford. In 1525 he was incorporated at Oxford in the same degree which he had taken at Cambridge. Before this, however, he had become the friend and intimate of William Tyndale, by whose means he had obtained a thorough conviction of the corruptions and errors of popery, and had adopted the principles of the reformers. On this account he was confined prisoner some time, and afterwards went beyond seas, where he became confirmed in his opinions, and resolved to return to his native country and devote himself to the propagation of them. In 1631 he embarked for England with this determination, leaving behind him a wife whom he had married; after this we hear no more of him till we find him wandering about from place to place reduced to great distress. So deplorable and mean was his appearance, that at Reading he was taken up by the magistrates, who, in those days, not unfrequently looked upon poverty as a crime, and put into the stocks. In this situation, so unworthy a man of letters, he refused to give any account of himself, till pressed by hunger he sent for the school-master of the town, with whom he conversed in the Latin language, and to whom he made known his wants, and exhibited those evidences of erudition and talent which he possessed, and which should have claimed, as they really merited, a very different treatment. Frith now, by the humane interference of the school-master, was liberated, and his wants supplied. Afterwards he came to London, where, through an honourable zeal for the truth, he was found endeavouring to make proselytes, and was seized by the emissaries of the lord-chancellor, sir Thos. More, and committed to the Tower in the year 1533. Frith was not contented with pleading the cause of the reformation by conversation and discourse, but drew up several tracts which he privately circulated among the converts to the new doctrines. Among these was a treatise on the Eucharist, shewing that the belief of the corporal presence of Christ was not a necessary article of faith. This was the first treatise written by the reformers of England on that side of the question. It was answered by sir Thos. More, who undertook also to reason with the author, but Frith was not easily changed: he wrote a reply to sir Thomas which was not published till some years afterwards. When no conviction could be produced on the mind of this honest man by the way of argument, other means were adopted: he was brought before an episcopal commission at St. Paul's cathedral, where he was interrogated on the subjects of transubstantiation and purgatory, and many efforts were made to persuade, or intimidate him to renounce the notions which he entertained respecting those doctrines, and to conform to the creed of the catholic church. He was, however, unmoved, and persisted in maintaining the truth, nor could he be persuaded to make any concession; accordingly the bishop of London, with much affected sorrow and commiseration, pronounced upon him sentence of condemnation as an obstinate heretic, and he was delivered over to the secular power. In pursuance of this sentence a writ was issued for his execution, and he was in a few days burnt at Smithfield, maintaining his fortitude to the last, and charitably extending his forgiveness to a bigotted priest who endeavoured to persuade the people that they ought no more to pray for him than for a dog. He was author of many pieces on the controverted points of theology which were originally printed separately, and at different periods, but which were afterwards collected into a folio volume in 1573. Gen. Biog.

Frith. See Fryth.

FRITHGILD, was anciently the same with what we now call a *guild*, or a *fraternity*, or *company*. See Gild.

FRITILLARIA, in *Botany*, from *fritillus*, which some take for a chess-board, and which in that sense alludes to the chequered nature of the petals. *Fritillus* however is used by Juvenal and Persius for a dice-box, and is supposed to have expressed the rattling sound of the dice.—Chequered Daffodil, or Snake's-head.—Linn. Gen. 164. Schreb. 219. Willd. Sp. Pl. v. 2. 90. Sm. Fl. Brit. 360. Ait. Hort. Kew. v. 1. 432. Mart. Mill. Dict. v. 2. Tourn. t. 201. Juss. 48. Gærtn. t. 17. Class and order, *Hexandria Monogynia*. Nat. Ord. *Coronariæ*, Linn. *Liliа*, Juss.

Gen. Ch. *Cal.* none. *Cor.* bell-shaped, spreading at the base, of six oblong parallel petals. Nectary a little cell in the base of each petal. *Stam.* Filaments six, awl-shaped, close to the style; anthers vertical, erect, oblong, quadrangular, extending to the open part of the corolla. *Pist.* Germen superior, oblong, triangular, obtuse; style simple, longer than the stamens; stigma three-lobed, spreading, obtuse. *Peric.* Capsule oblong, obtuse, three-lobed, of three cells, and three valves. *Seeds* numerous, horizontal, flat, rounded at the outer edge, ranged in two rows.

Obs. *Fritillaria* of Tournefort has an oblong nectary, and an even capsule.

Corona Imperialis of Tournefort, t. 197, 198, has a hemispherical nectary, and a sharp-edged capsule.

Ess. Ch. Corolla inferior, bell-shaped, of six petals, with a nectariferous cavity above the claw of each. Stamens nearly the length of the corolla. Calyx none. Seeds flat.

1. F. *imperialis*. Crown Imperial. Linn. Sp. Pl. 435. Curt. Mag. t. 194. 1215.—"Cluster of many flowers, crowned with leaves, the stem naked below it."—Supposed to be a native of Persia. It was brought from Constantinople to the gardens of Europe, where it is quite hardy. The *root* is a large scaly bulb. *Herb* of very quick growth, fœtid, two or three feet high, succulent, of a fine shining green, consisting of a thick, simple, straight, leafy stem. *Leaves* scattered, linear-oblong, twisted. *Flowers* drooping, large, orange or lemon-coloured. *Fruit* erect. There is a variety with variegated leaves, and one with a red stem.

2. F. *persica*. Persian Fritillary.—Linn. Sp. Pl. 436. (Lilium persicum; Ger. em. 201.)—"Cluster nearly naked. Leaves oblique."—Supposed also to be a native of Persia. It was cultivated in England by Gerarde and Parkinson, but is not very common, though quite hardy. The *herbage* is glaucous. *Flowers* numerous, dull purple, smaller than in any other species.

A variety with fewer but brighter flowers is given in Curt. Mag. t. 962. This is the β of Linnæus.

3. F. *verticillata*. Whorled Fritillary. Willd. Sp. Pl. v. 2. 91.—"Leaves whorled, linear-lanceolate. Stem single-flowered."—Native of Siberia. *Stem* a foot high, erect. *Leaves* four or five in a whorl, sessile, linear, very slender-pointed, the ends curled when dry, so as to resemble tendrils. *Flower* terminal. *Willdenow.*

4. F. *obliqua*. Violet-flowered Fritillary. Curt. Mag. t. 857.—"Leaves very glaucous, scattered, twisted. Flowers few, on terminal leafy stalks. Corolla obovate, connivent."—Country unknown. *Flowers* two to four, thrice as large as in *F. persica*. A hardy early-flowering species. *Gawler.*

5. F. *pyre-*

5. F. *pyrenaica.* Pyrenean Fritillary. Linn. Sp. Pl. ed. 1. 305. excluding the quotation of Hort. Cliff. (which moreover ſhould be Hort. Upſal.) Sm. Prod. Fl. Græc. Sibth. v. 1. 228. Curt. Mag. t. 664.—“ Leaves ſcattered, flattiſh ; the lower ones broadeſt and blunteſt. Petals recurved at the ſummit. Nectary roundiſh.”—Native of the Pyrenean mountains. *Cluſius.* Of mount Parnaſſus. *Sibthorp.*—A ſpan high. *Leaves* five to ſeven, glaucous, thick and leathery, rather glaucous. *Petals* tawny-purple, yellowiſh internally, as well as at the extremity, which is dilated and recurved. The three outer ones are gibbous at the baſe.

6. F. *racemoſa.* Cluſter-flowered Fritillary. Curt. Mag. t. 952. 1216. (F. pyrenaica; Linn. Sp. Pl. ed. 2. 436).—Leaves linear, pointed, flattiſh. Cluſter leafy, of ſeveral flowers. Petals nearly erect, all gibbous at the baſe. Nectary oblong.—Native of Siberia, &c. It is not rare in gardens about London, and greatly reſembles the following, except in having more numerous and ſmaller *flowers.*

7. F. *Meleagris.* Common Fritillary. Linn. Sp. Pl. 436. Curt. Lond. faſc. 3. t. 20. Sm. Engl. Bot. t. 622. Fl. Dan. t. 972. Jacq. Auſtr. app. t. 32.—Leaves linear, pointed, keeled. Stem ſingle-flowered. Petals ſlightly incurved. Nectary linear.—Native of various parts of Europe, flowering in April. *Stem* a foot high, always ſimple, bearing one large pendulous *flower*, regularly chequered with purple, or with different whites. All the *petals* are gibbous at the baſe, their tips ſlightly inflexed.

8. F. *latifolia.* Broad-leaved Fritillary. Curt. Mag. t. 853. 1207. Redouté Lil. v. 1. t. 51.—Leaves elliptic-lanceolate, obtuſe; the upper ones crowded. Stem ſingle-flowered. Petals ſlightly incurved. Nectary oblong.—Native of Mount Caucaſus. The broad *leaves*, numerous at the top of the ſtem, diſtinguiſh this from the laſt. The *flower* alſo is rather larger, and leſs regularly chequered. The *leaves* are leſs glaucous. It is not rare in gardens.

Fritillaria, in *Gardening*, comprehends plants of the bulbous-rooted perennial flowery kind ; of which the ſpecies moſtly cultivated are the common fritillary, or chequered lily (F. meleagris) ; the black fritillary (F. pyrenaica) ; the imperial fritillary, or crown imperial (F. imperialis); the Perſian fritillary, or Perſian lily, (F. Perſica).

Of the firſt of which there are numerous varieties, as the common purple ; the blood red ; the great purple or red ; the white ; the double bluſh ; the purple yellow ; the chequered yellow ; the great yellow Italian ; the ſmall Italian ; the ſmall Portugal yellow ; the black, and the Spaniſh black.

And of the third there are varieties with yellow flowers ; with large flowers ; and with double flowers ; but that which has two or three whorls of flowers above each other makes the fineſt appearance, though it ſeldom produces its flowers after this manner the firſt year after removing it.

The laſt ſort has a variety which has a much ſhorter ſtem and ſmaller leaves ; the ſtem branches out at the top into ſeveral ſmall peduncles, each ſuſtaining one dark-coloured flower, which is termed the dwarf Perſian lily.

Theſe plants are all of them highly deſerving of places in the flower-garden.

Method of Culture.—The common mode of propagation in all theſe plants is by off-ſets from the ſides of their roots, ſeparated every ſecond or third year ; the proper time for which is when their flower-ſtalks decay, taking the whole roots up entirely, and ſeparating them into diſtinct roots, then planting the ſmaller off-ſets by themſelves in nurſery-beds, to remain a year or two, to acquire a flowering ſtate; and the larger roots, where they are to remain for flowering in the ſummer ſeaſon.

They are likewiſe capable of being propagated by ſeed ; but this is principally practiſed for new varieties, and the proceſs is tedious ; the fritillary and Perſian lily being three years, and the crown imperial ſometimes ſix or ſeven, before they flower in perfection. The ſeeds may be ſown in the beginning of autumn in large wide pots, or in boxes of ſimilar width, filled with light, mellow earth, each ſort ſeparate, covering them evenly with fine earth half an inch deep, placing the pots, &c. to have only the morning ſun all ſummer, or during hot, dry weather, and in the full ſun in winter and ſpring : the plants will appear in the ſpring, which after the firſt or ſecond year's growth, when the leaves decay in ſummer, may be taken up, and the whole planted immediately in nurſery-beds, in ſhallow drills, four inches aſunder, to remain till they flower in that ſituation.

They are all hardy, and highly ornamental plants for the borders, clumps, and other parts ; the fourth ſort being ſet backwards, the third in the middle, and the others forwards, in order that they may make the fineſt appearance poſſible.

FRITZ, Gasparo, in *Biography*, a very agreeable performer on the violin, and compoſer for that inſtrument. He had ſtudied under the celebrated violiniſt, Somis, and in the year 1770, he had been reſident at Geneva 30 years. He was well known to all Engliſh travellers who had entered or quitted Italy, through Geneva, during that period. We heard him perform one of his own ſolos in 1770, which, though extremely difficult, was pleaſing ; and notwithſtanding his time of life, he executed it with as much ſpirit as a young man of twenty-five ; his bowing and expreſſion were admirable, and he muſt have been a *real* lover of his art to keep in ſuch high practice, with ſo few opportunities of diſplaying his talents, or of receiving their due reward. When he viſited Paris, about the middle of the laſt century, his ſtyle of compoſition was ſo much too good for the taſte which then prevailed in France, that he had the honour of being hiſſed at the concert ſpirituel, as Pugin, one of the beſt ſcholars of Tartini, was afterwards.

FRITZLAR, in *Geography*, a town of Germany, in the principality of Lower Heſſe ; ſituated on the Eder ; containing two colleges and a convent ; 13 miles S.S.W. of Caſſel. N. lat. 50° 8′. E. long. 9° 13′.

FRIULI, a province of Italy, bounded on the N. by Carinthia, on the E. by the county of Goritz, and the gulf of Trieſte ; on the S. by the gulf of Venice, and on the W. by the Trevifan, the Feltrin, and the Belluneſe ; about 52 miles from north to ſouth, and 45 from eaſt to weſt. This country was taken from the Lombards by Charlemagne, and has belonged to the Venetians from the year 1420. It is partly flat and partly mountainous ; the hilly part toward Germany is the moſt ſterile and uninhabited, and forms part of the Alps which ſeparate Italy from Germany ; and on the other ſide this country is interſected by another ridge of mountains. The roads through theſe mountains to Germany are in ſome parts ſo narrow, that it is dangerous to paſs them either on foot or on horſeback ; and only the paſſes, Chiuſa di Venzone, Tolmino, and Lubiana, admit of waggons and artillery. The flat part of Friuli is very fertile, and the country produces a quantity of timber and fire-wood, game, all kinds of grain, fruit, and good wine, among which is the famous “ piccali.” The breeding of cattle is a very conſiderable occupation of the inhabitants, and the culture of ſilk is ſo extenſive, that it produces yearly 1000 *cwt.* which is deemed ſome of the fineſt in Italy. The principal rivers are, the Tagliamento, the Meduna, Cellina, Stella, Torre, and Natiſone. The

inhabitants,

inhabitants, denominated Furlani, ſpeak a dialect reſembling that of the ancient French language, differing widely from the Italian or German idiom: they are conſidered as the moſt hot-headed, indolent, and wild inhabitants of Italy. The whole province is divided into the dioceſes of Udina and Concordia, and contained, in the year 1795, 365,512 perſons, who live in 4 cities, 20 ſmall towns and boroughs, and 600 villages. By the peace of Luneville the whole country of Friuli was ceded to the emperor of Auſtria; but afterwards, agreeably to the peace of Preſburg, it was taken from Auſtria and annexed to the new kingdom of Italy.

Friuli, or *Citta di Friuli*, a town of Italy, in a country of the ſame name above-deſcribed; the ſee of a biſhop, the ſuffragan of Aquileia. It is ſituated at the foot of the mountains, which ſeparate Friuli from Carniola, on the river Naiſonne, and is the ſecond capital of the province. Acroſs the river which riſes near the town is a bridge, with two arches, 220 feet in length, and 75 feet high. The town is well built, and contains a collegiate church, with a chapter; three monaſteries, 62 nunneries, and 4000 inhabitants. N. lat. 46° 10′. E. long. 31° 21′.

FRIZE, or Frieze, in *Architecture*, a part of the entablature of columns, more uſually written and pronounced *freeze*.

Frize, or *Freeze*, in *Commerce*, a kind of woollen cloth or ſtuff, for winter wear, being frized, or knapt, on one ſide; whence, in all probability, it derives its name.

Of frizes, ſome are croſſed, others not croſſed: the former are chiefly of Engliſh manufacture, the latter of Iriſh.

FRIZING *of Cloth*, a term in the *Woollen Manufactory*, applied to the forming of the knap of a cloth, or ſtuff, into a number of little hard burrs, or prominences, covering almoſt the whole ground thereof.

Some cloths are only frized on the back ſide, as black cloths; others on the right ſide, as coloured and mixed cloths, ratteens, bays, frizes, &c.

Frizing may be performed two ways; one with the hand, *i. e.* by means of two workmen, who conduct a kind of plank, that ſerves as a frizing inſtrument.

The other way is by a mill, worked either by water, or a horſe; or ſometimes by men. The latter is eſteemed the better way of frizing, becauſe the motion being uniform and regular, the little knobs of the frizing are formed more equably and regularly.

The ſtructure of this uſeful machine is as follows:

The three principal parts are, the frizer, or criſper; the frizing-table; and the drawer, or beam. The two firſt are two equal planks, or boards, each about ten feet long, and fifteen inches broad; differing only in this, that the frizing-table is lined or covered with a kind of coarſe woollen ſtuff, of a rough, ſturdy knap, and that the frizer is incruſtated with a kind of cement compoſed of glue, gum Arabic, and yellow ſand, with a little aqua vitæ, or urine. The beam or drawer, thus called becauſe it draws the ſtuff from between the frize and frizing-table, is a wooden roller, beſet all over with little, fine, ſhort points or ends of wire, like thoſe of cards uſed in carding of wool.

The diſpoſition and uſe of the machine are thus: the table ſtands immoveable, and bears or ſuſtains the cloth to be frized, which is laid with that ſide uppermoſt on which the knap is to be raiſed. Over the table is placed the frizer, at ſuch a diſtance from it as to give room for the ſtuff to be paſſed between them; ſo that the frizer, having a very ſlow, ſemi-circular motion, meeting the long hairs or knap of the cloth, twiſts and rolls them into little knobs or burrs, while, at the ſame time, the drawer, which is continually turning, draws away the ſtuff from under the frizer, and winds it over its own points.

All that the workman has to do while the machine is going, is to ſtretch the ſtuff on the table as faſt as the drawer takes it off, and, from time to time, to take off the ſtuff from the points of the drawer.

It has already been obſerved, that the frizing-table is lined with ſtuff of ſhort, ſtiff, ſtubby knap; the uſe whereof is to detain the cloth between the table and frizer, long enough for the grain to be formed, that the drawer may not take it away too readily; which otherwiſe muſt be the caſe, inaſmuch as it is not held by any thing at the other end.

It were needleſs to ſay any thing particular of the manner of frizing ſtuffs with the hand, it being the aim of the workmen to imitate, as near as they can, with their wooden inſtrument, the ſlow, equable, and circular motion of this machine. It needs only be added, that their frizer is but about two feet long, and one broad; and that to form the knap more eaſily, they moiſten the ſurface of the ſtuff lightly with water, mingled with whites of eggs, or honey.

FROBEN, John, in *Biography*, an eminent printer, was born at Hammelburg in Franconia. He enjoyed the advantages of a liberal education, and acquired conſiderable reputation at Baſil. As the buſineſs of a printer was at that period connected with the profeſſion of letters, Froben was induced to learn it, and to ſet up a preſs in the city of Baſil, where he not only became eminent in the art, but ſupported its dignity and utility by a ſcrupulous choice in the authors that he printed. He never ſuffered improper writings to iſſue from his preſs, but devoted it to the ſervice of ſound and uſeful learning. The reputation of Froben was ſo high that Eraſmus ſettled at Baſil for the ſake of having his works printed by him. That great ſcholar ſoon became intimately connected with Froben, and always teſtified for him the higheſt eſteem and affection. From Froben's preſs iſſued the works of Eraſmus, in nine volumes folio, and alſo thoſe of St. Jerome and Auguſtine, which Eraſmus corrected and reviſed. Theſe are ſaid to be the moſt correct of Froben's editions. He intended printing the Greek fathers, but was prevented by his death, which happened in 1527. He was ſincerely lamented by Eraſmus, who wrote, on the occaſion, a Greek and Latin epitaph. Jerome Froben, ſon of John, and his ſucceſſor in the printing-office, in conjunction with Nicholas Epiſcopius, carried into effect the deſign of printing the Greek fathers. At the houſe of Jerome Froben Eraſmus died, after an eminently uſeful life. A catalogue of all the works printed at the Frobenian preſs was publiſhed in 1564. Moreri.

FROBENIUS's *Ætherial Spirit*. See Æther and Spirit.

FROBERGER, John, Jacob, in *Biography*, organiſt to the emperor Ferdinand III., who in his youth had been ſent to Rome to ſtudy under the celebrated Freſcobaldi, was regarded about the middle of the laſt century as the greateſt performer on the organ in Germany. He is much celebrated for his abilities by Kircher, who has inſerted a fantaſia of his compoſition in his "Muſurgia," upon the hexachord *ut*, *re*, *mi*, *fa*, *ſol*, *la*, accommodated to the organ. Few of his compoſitions were publiſhed in his life time; but, according to Walther, his pieces for keyed inſtruments were ſtill highly eſteemed among organiſts in 1732, and heard with admiration. Mr. Marpurg ſays, that his works will be always models for regular good fugues. (Art de la Fugue, Berlin, 1756.) His compoſitions for the harpſichord were publiſhed at Mayence in 1696. And ſo late as 1714, the moſt important of his works appeared, for the firſt time, at Francfort on the Mayne.

Diverſe

Strahan and Preſton,
New-Street Square, London.

"Diverſe ingegnoſiſſime, rariſſime et non mai più viſte curioſe partite, di toccate, canzone, ricercate, allemande, correnti, ſarabande, et gighe, di cimbali, organi, iſtromenti, dal eccelentiſſimo, e famoſiſſimo organiſta, Giov. Giacomo Froberger, per la prima volta col diligentiſſimo ſtudio ſtampate."

FROBISHER, *Sir* MARTIN, was born near Doncaſter, Yorkſhire, and brought up for the ſea ſervice, in which he became one of the moſt eminent navigators of his time, and was the firſt Engliſhman that attempted to find out a north-weſt paſſage to China. It was long before he was enabled to make the trial. He applied to his friends, and the merchants in general, but they were unwilling to embark in ſo hazardous an enterprize: at length finding that there was no chance of ſucceſs from private encouragement, he boldly applied to the court of queen Elizabeth, and by this was enabled to fit out a ſmall equipment conſiſting of two barks of twenty-five tons burthen each, and a pinnace of ten tons. He failed from Deptford June 8th, 1576, and in about ſix weeks made the coaſt of Greenland. Here he ſpent ſome time in exploring and making ſuch obſervations as might be uſeful to himſelf and future navigators, and then, on Auguſt 11th, entered and ſailed up the ſtrait which has ever ſince borne his name. This is in N. lat. 62° 50′, on the eaſtern ſide of New Greenland, which terminates to the ſouth at Cape Farewell. Having touched at various parts, he brought his veſſel to an anchor under Burcher's iſland, where they went on ſhore, and had ſome communication with the natives; but at the ſame time he had the misfortune to loſe five of his men, who were captured by the people. Having endeavoured in vain to recover his ſailors, he embarked for England, where he arrived ſafe on the 2d of October. He had taken poſſeſſion of the country in the name of queen Elizabeth, and in proof of the diſcovery and poſſeſſion, he ordered his men to bring him whatever they could find. One of them returned with a large piece of black ſtone, very heavy, but in other reſpects reſembling ſea-coal: it was probably a kind of pyrite, and was, upon trial, after their return, ſaid to contain a portion of gold. A new Peru was now anticipated, and a ſecond voyage determined on in the following ſpring. At this period of our mineralogical knowledge it is certain that the report of gold being found in this black ſtony ſubſtance muſt have proceeded from ignorance, or perhaps from the deſire of being ſo far patronized by public conſent, as to obtain means for proſecuting farther diſcoveries. The fraud, if it were a fraud, ſucceeded; the queen lent Frobiſher a ſhip of the royal navy, of two hundred tons, to which he added two ſmall barks. Volunteers, ſome from the firſt families in the kingdom, preſſed in from all quarters; but as the number was reſtricted to one hundred and forty, many were obliged to return diſappointed and uneaſy. Such was the deſire of gold, that the commiſſion under which Frobiſher ſet out in this voyage directed him "only to ſearch for ore, and to remit diſcovery till another time." He ſailed on the 31ſt of May, 1577, and proceeding to his former ſtrait, explored all its coaſts and bays, and landed on ſeveral iſlands, where the crews furniſhed themſelves with a quantity of the ſuppoſed ore. On their return the cargo was examined, and thought to promiſe much wealth: a third expedition was planned, and inſtead of three, fifteen veſſels were fitted out for the purpoſe of being laden, as they expected, with the precious mineral. This was the laſt of the expeditions, for the true nature and real value of the ſubſtances found in that bleak country were now properly appreciated. There is no account left us how Frobiſher ſpent his time from the termination of this expedition till the year 1585, when he was appointed to the command of the Aid in ſir Francis Drake's expedition to the Weſt Indies, which took St. Domingo in Hiſpaniola, Carthagena on the continent, and Santa Juſtina in Florida, three towns of conſiderable importance. In 1588 he bravely exerted himſelf in defence of his country againſt the famous Armada, having the command of the Triumph, one of three of the largeſt ſhips in the navy, and which had on board the greateſt number of men of any in the whole Engliſh fleet. For his ſervices on this important occaſion he received the honour of knighthood. He afterwards commanded ſquadrons againſt the Spaniards in 1590 and 1592, and took two very rich prizes. In 1594 he was ſent with four men of war to the aſſiſtance of Henry IV. king of France againſt a body of the leaguers and Spaniards, then in poſſeſſion of part of Bretagne; but in an attack upon a fort near Breſt he received a mortal wound from a ſhot, of which he died after his return home. He was buried at Plymouth. Sir Martin Frobiſher is ſaid to have had the roughneſs and violence which frequently characterize the profeſſion, and he was unqueſtionably a man of great and undaunted courage, and inferior to no one of his age in experience and conduct as a naval commander. Biog. Brit.

FROBISHER's *Straits*, in *Geography*, a narrow ſea on the weſt of Davis's ſtrait, to the ſouth of cape Walſingham of Frobiſher. N. lat. 61° 50′ to 63° 20′. W. long. 65° to 70°.

FRODSHAM, a ſmall town in the hundred of Eddiſbury, and county of Cheſter, is pleaſantly ſituated on an elevated ſpot, at a ſhort diſtance from the confluence of the rivers Weaver and Merſey, two miles diſtant from Cheſter, and one hundred and ninety-three from London. Here was formerly a fortified manſion, called Maurice caſtle, which, together with the town, was granted by Edward I. to David, brother to Llewelyn, the laſt ſovereign prince of North Wales; with a view of ſeparating the former, in his affections and intereſt, from that of his family and country: in which unnatural attempt the king was moſt diſaſtrouſly foiled. It ſtood at the weſt end of the town, and was at one time the reſidence of the Savages, earls Rivers; but having been conſumed by fire in 1642, its ſcite has ſince been occupied by a handſome modern houſe. The town conſiſts of two main ſtreets croſſing each other, and at the upper end of one, on an elevated ſpot called Overton, ſtands the church, an ancient and excellent ſtructure, repaired and beautified in 1790; and near it the free grammar ſchool, with a good houſe for the maſter; which has a cupola on the top intended for an obſervatory. Behind the ſchool is an eminence, where formerly a beacon was erected, thence denominated Beacon-hill, which is cut out into walks, gradually aſcending to the ſummit, and commanding a delightful proſpect of the eſtuaries of the Merſey and the Dee, with the diſtant parts of Lancaſhire and the ſurrounding country. The town is well ſupplied with water by ſeveral ſprings, one of which, uſed as a cold bath, is notable for its power, throwing out the immenſe quantity of 1700 gallons per minute. By the returns made to parliament in 1801, the number of houſes was 272, containing 1551 inhabitants, chiefly employed in the refining of rock-ſalt, and in a ſmall manufacture of coarſe cottons. It has a well ſupplied weekly market on Thurſdays, and two annual fairs. A graving dock and yard have lately been erected for building and repairing veſſels, which promiſes to be of conſiderable utility to the place.

The pariſh is of great extent, being thirty-one miles in circumference, containing ten ſmall villages, beſides the town, and is famous for the great quantities of potatoes cultivated in

in it; the average annual amount of which, for fome years paft, has not been lefs than 100,000 bufhels, each weighing nearly one hundred weight: thefe are difpofed of to the numerous manufacturers in the adjoining county. This anciently formed part of an extenfive tract called the foreft of De la Mere, which, in the time of Leland, abounded with red and fallow deer; but at prefent exhibits merely a bleak and dreary wafte in its general afpect, confifting of a fandy heath, tenanted by rabbits; and the chamber, or centre of the woodlands, is marked by a few ftunted trees. Hiftory of Chefhire, in two volumes 8vo.

FROELICH, Erasmus, in *Biography*, was born at Gratz, in Styria, in 1700. He entered the fociety of the Jefuits when he was fixteen years of age, and was fo indefatigable and fuccefsful in his ftudies, that he was, in a fhort time, appointed profeffor of mathematics and belles lettres at Vienna. Here he purfued his ftudies with great ardour, and made ufe of his fituation in that city to purfue the medallic fcience, on which he publifhed various tracts, chiefly on particular medals. He died in 1758: his principal works are, "Quatuor Tentamina in Re Nummaria," 4to. 1737, and 1750: "Annales rerum et regum Syriæ," 1751, "De Figura Telluris," 4to. 1757.

FROELICHIA, in *Botany*, in honour of Dr. J. A. Froelich, member of the botanical fociety of Ratifbon, author of an octavo volume on Gentiana, publifhed at Erlang in 1796. Willd. Sp. Pl. v. 1. 607. (Billardieria; Vahl. Eclog. v. 1. 13. t. 10.) Clafs and order, *Tetrandria Monogynia*. Nat. Ord. *Rubiaceæ*.

Gen. Ch. *Cal.* Perianth fuperior, of one leaf, permanent, with four flight teeth. *Cor.* of one petal, fuperior, about an inch long, thick; limb in four linear-lanceolate, widely fpreading, flightly recurved fegments; thickened and triangular at the tips; acutely carinated above; flat from the middle to the bafe. *Stam.* Filaments four, very fhort, inferted into the lower part of the tube; anthers erect, linear, a little prominent. *Pift.* Germen inferior, elliptical; ftyle nearly as long as the limb of the corolla; ftigmas two, oblong, compreffed, bluntifh, fpreading, rather thick. *Peric.* Berry elliptical, dry, corky, hardifh, flightly compreffed, as long as the nail, crowned with the fhort permanent tube of the calyx, within which is a fmall convex callofity. *Seed* folitary, the fhape of the berry, clothed with a loofe arillus of a paper-like texture, without any divifion.

Eff. Ch. Calyx fuperior, with four teeth. Corolla tubular. Berry dry, with one feed, invefted with an arillus.

1. F. *paniculata*. Native of the ifland of Trinidad. A fhrub, with fquare *branches*. *Leaves* oppofite, elliptic-lanceolate, pointed, entire, fmooth. *Panicle* terminal, with fmooth purplifh branches, divided and fubdivided, bearing numerous flowers. This genus is nearly akin to *Coffea*, and is fufpected by Vahl to be fcarcely diftinct from Aublet's *Couffarea*. The colour of the flowers is not mentioned, Vahl having feen dried fpecimens only, but they are probably white.

FROG, in *Zoology*. See Rana. This creature bears the experiments of the air-pump better than moft other animals. It will breathe fome time after the extraction of the air, but at length the vifible motion of the throat will ceafe, and the body fwell a little. After three hours lying in this condition, when no farther fign of life appears, if the animal be placed in the open air, a few hours will recover it to its former life and vigour. The fame animal, put into a receiver exhaufted of the air, but nearly filled with water, will live many hours under the water, and feem to refpire, but in five or fix hours it will die. The larger and luftier frogs live longer than the young ones in the receiver. Phil. Tranf. N° 62.

The frog affords the curious in microfcopic obfervations a very beautiful view of the circulation of the blood; but the method of examining it to advantage was never hit upon till the contrivance of the late ingenious Dr. Stuart for that purpofe. This he did by the folar microfcope in the following manner: The looking glafs, tube, and convex lens, are the fame in this as in the common folar microfcope; but inftead of the little pocket microfcope of Wilfon, he ufed the belly-part of the common large reflecting one, fixed horizontally on a pedeftal, juft at an equal height with the tube. This ftands on a little fhelf made to fupport it; and to its fnout, which lies on a level with the tube, the magnifiers are fcrewed: the object, being extended and faftened with ftrings and pins on a frame contrived for that purpofe, is applied between the tube and the magnifier, whereby the fun's rays, reflected from the looking-glafs, through the tube, upon the object, pafs on through the magnifier, and exhibit upon the fcreen an image of the object moft prodigioufly enlarged.

To view a frog with this apparatus, the fkin of the belly is to be opened from near the anus to the throat, and then giving it a little fnip fide-ways both at the top and bottom, and fticking a fifh-hook into each corner of the fkin, it was eafily extended before the microfcope, and fhewed on the fcreen the moft beautiful view imaginable of the veins and arteries of the fkin, with the blood circulating through them. In the arteries thus viewed, the blood is feen to ftop, and recede a little at every pulfation by the dilatation, and rufh forcibly on again by the contraction of the heart; while in the veins it ever kept the fame equable and uniform current, with a furprifing rapidity; and when the fcreen was removed farther back, and the object by that means more enlarged, the alternate expanfion and contraction of the fides of the arteries were very vifible. After this, the abdomen of the frog being opened, and the mufcles of it being extended before the microfcope in the fame manner as the fkin was, the ftructure of thefe mufcles is beautifully feen, being all made up of bundles of tranfparent ftrings of fibres, all lying parallel to one another, and joined by a common membrane.

Thefe ftrings or fibres appeared alfo through their whole length made up of roundifh veficles, and refembled rufhes divided longitudinally; but there is no certainty of any circulation being feen in thefe.

When this has been fufficiently examined, a part of the creature's guts being pulled out and extended with the mefentery, there is feen the fineft of all views of the circulation of the blood. Words are not able to defcribe this wonderful fcene. The blood is feen paffing through numberlefs veffels at one and the fame inftant, in fome one way, and in others directly the contrary. Several of the veffels are thus magnified to more than an inch in diameter, and the globules of the blood rolling through them appear nearly as large as pepper-corns; while in many of the minuteft veffels only fingle globules were able to find their paffage, and that too by changing their fhape into an oblong fpheroid. The pulfation and acceleration of the blood in the arteries are thus alfo very beautifully feen. As the animal under examination grows languid and near expiring, the blood in the arteries will often ftop on a fudden, and feem as if it were coagulating, and will then run back for fome time; after which it will again recover its natural courfe with a great deal of rapidity. A due confideration of thefe particulars may poffibly account for the intermiffions, ftarts,

ſtarts, and irregularities, in the pulſe of perſons near death. Baker's Microſcope, p. 132—136.

FROG, among *Farriers*, the ſame with fruſh. See FRUSH.

FROG'*s-bit*, in *Botany*. See HYDROCHARIS.

FROG, *Bull*. See BULL-*frog*.

FROG-*fiſh*, in *Ichthyology*, an Engliſh name for the *rana-piſcatrix*, or *lophius*. See LOPHIUS *Piſcatorius*.

FROG-*fiſh of Surinam*, is produced by the transformation of a frog into a fiſh. The frog, in its firſt ſtate, is ſpotted with brown, yellow, and green, but paler on the belly; the hinder feet are webbed like thoſe of a gooſe, but the fore-feet are without webs: the firſt change this frog undergoes is by the growing out of a tail; after which it gradually acquires the ſhape of a fiſh, the two fore-feet decreaſing and periſhing by degrees, and then the hinder legs; and, at length, the frog is changed into a perfect fiſh. The Indians and Europeans of Surinam call theſe fiſhes jakies; they are cartilaginous, and of a ſubſtance like our muſtela, and very delicate food. A bone or cartilage runs down the back, with ſmall bones all over the body, which is divided into equal parts; they are adorned with beautiful ſcales, and are firſt of a darkiſh colour, and afterwards grey. See an account of the ſeveral transformations of this frog, illuſtrated with drawings, and of the transformation of fiſhes into frogs, in Phil. Tranſ. vol. li. p. 2. art. 60. p. 653, &c.

FROG, in *Geography*, a town of America, in the ſtate of Georgia; 6 miles W. of Tugeloo.

FROG, *Lake*, a lake of N. America, in N. lat. 53° 15'. W. long. 91° 50'.

FROG, *Petrified*, in *Natural Hiſtory*. Among the petrifactions found in the Stirling limeſtone, or ſwineſtone of Oering, frogs (ranæ) have been mentioned; but it does not appear that their perfect identity with the recent animal has been made out. Among the numerous inſtances of animals, like frogs and toads, ſaid to be found alive in ſtone, clay, and other mineral ſubſtances, ſeveral inſtances of which have been related to the writer of this by quarry-men and others of veracity, ſo that he can ſcarcely doubt the fact, at leaſt of animals not petrified or altered from their living ſtate, being thus found; it is to be lamented, that none of them have been ſubmitted to examination and diſſection by a competent anatomiſt, who might decide on their identity with the recent ſpecies, in the genus to which they ſeem referable. See TOAD.

FROHBURG, in *Geography*, a town of Germany, in the circle of Leipſic, ſituated on the Wichra; 15 miles S.S.E. of Leipſic. The inhabitants manufacture ſtuff and earthen ware. N. lat. 51° 5'. E. long. 12° 28'.

FROHNA, a town of Germany, in the circle of Erzgeburg; 8 miles N.W. of Chemnitz.

FROHNSDORF, a town of Germany, in the circle of Thuringia; 7 miles S.E of Weiſſenſee.

FROJAN, a town of Spain, in Galicia; 22 miles N.N.E. of Orenſe.

FROIDMONT, LIBERT, in *Biography*, was born in a country town, ſituated between Liege and Maeſtricht, in the year 1587. He was profeſſor of philoſophy in the univerſity of Louvain, and in 1633 was appointed dean of St. Peter's in that city. After this he was created doctor of divinity, and ſucceeded Janſenius, who was appointed biſhop of Ypres, as interpreter of the ſacred ſcriptures. He died in 1653, at the age of ſixty-ſix. His writings are proofs of his great learning on various ſubjects. He was author of "Diſſertatio de Cometa," Anni. 1618. "Meteorologicorum Libri V." "Brevis Anatomia hominis." Latin commentaries on the Acts of the Apoſtles, and on the epiſtles of St. Paul in folio, and on other works. The commentaries are in much repute, though they are, in a meaſure, abridged from the works of Eſtius. Moreri.

FROJERED, in *Geography*, a town of Sweden, in Weſt-Gothland; 70 miles E. of Uddevalla.

FROISSART, JOHN, in *Biography*, an early French hiſtorian and poet, was born at Valenciennes in 1337. The works of this writer have lately been reprinted, and obtained a moſt extenſive circulation; ſtill there is a great lack of materials for an account of his life. In ſome manuſcripts he is repreſented as a knight, in moſt as an eccleſiaſtic, and from a paſſage in his own works it is inferred that he was at one period a merchant. It is not known who was his father, but it is ſuppoſed that he was a herald painter, a circumſtance which would account for the attachment of the ſon to the heraldic ſcience, and to the manners of chivalry by which he is diſtinguiſhed. He began his hiſtory before he had attained to the age of manhood, and continued it till within a ſhort time of his death, the date of which has not been aſcertained, though there are facts which lead one to imagine that it did not happen till about 1420, and his hiſtory is brought down to the beginning of that century. A large portion of his life was employed in travelling from court to court, with a view of collecting materials for his "Chronicles." He was patronized by princes of oppoſite intereſts, and was perſonally acquainted with the chief actors in the ſcenes which he deſcribes. The mode which he adopted to obtain information was to procure admiſſion to the ſociety of thoſe who had borne a part in all the principal events of their times, and to live with them on terms of familiarity; and as he was well and kindly received by both parties, he had an opportunity of comparing the oppoſite accounts. Philippa, queen of Edward III. of England, was one of his earlieſt and beſt friends; he reſided long at her court, and travelled over the greater part of Europe at her expence. He was appointed ſecretary to this queen in 1361, and continued five years in her ſervice; during which period he viſited Scotland, and was entertained for ſome time by William earl of Douglas. In 1366 he was in Gaſcony with Edward the Black Prince, and afterwards viſited ſeveral of the Italian courts. In 1369, he loſt his kind patroneſs Philippa, and retiring to his own country, obtained a benefice in the dioceſe of Cambray. He ſeems however but ill qualified for the office of the cure of ſouls, as well from his love of pleaſure, as from his devotedneſs to hiſtorical reſearch and compoſition. He had already given conſiderable ſpecimens of his poetical talents, and now entered into the ſervice of the duke of Brabant, who was alſo a poet. From the compoſitions of his maſter, joined with ſome of his own, he formed a kind of romance, entitled "Meliador," relating to love and chivalry. After the deceaſe of the duke in 1384, he acquired the patronage of Guy earl of Blois, and travelled to the court of Gaſton earl of Foix, by whom he was received with great cordiality, and who liſtened with intereſt to the recital of his verſes. After ſome other travels he returned home, and continued his hiſtory. In 1395 he viſited England again, and was introduced to Richard II., a young man, by whom he was graciouſly and kindly received, and to whom he had the honour of preſenting a ſplendid copy of his "Meliador."

He returned to his own country, fixed his reſidence at Chimay, where he was appointed canon and treaſurer of the collegiate church. At this place he probably died, for the following verſes are found in the archives of the chapter of St. Monegunda, which are truly characteriſtic of the hiſtorian.

 "Gallorum

"Gallorum ſublimis honos at fama tuorum,
Hic, Froiſſarde, jaces, ſi modo forte jaces.
Hiſtoriæ vivus ſtuduiſti reddere vitam,
Defunćto vitam reddet at illa tibi."

Though Froiſſart was the author of thirty thouſand verſes, his poetical character is ſunk into oblivion, and he is celebrated only as an hiſtorian. In this capacity he is highly valued by thoſe who ſtudy ancient manners from original drafts.

His Chronicle, which is divided into four books, comprehends the period between 1326 and 1400, and it relates the events which took place not only in France, but in Flanders, Scotland, and Ireland, with numerous details reſpecting the papal courts of Rome and Avignon, and collateral particulars of the tranſactions in the reſt of Europe, in Turkey, and even in Africa. His reputation ſtands high as a faithful and diligent narrator of what he ſaw and heard. By the French he has been charged with groſs partiality towards the Engliſh; they bring againſt him the crime of making Edward, and his ſon, the Black Prince, the heroes of his hiſtory. But it cannot be denied that they were the heroes of the age in which they flouriſhed, and therefore an impartial hiſtorian was obliged to repreſent them in their true colours, and to make them the leading characters of the day. Mr. Johnes, in his edition of Froiſſart's Chronicles, has ſuccesſfully vindicated the character of the hiſtorian from the charge of partiality: throughout the whole work, he ſays, there is an evident diſpoſition to give praiſe to valour on whatever ſide it was employed. The hiſtorian mourns over the death of each valiant knight, exults in the ſucceſs of every hardy enterprize, and ſeems carried away almoſt by his chivalrous feelings, independently of party conſiderations. Till the publication of Mr. Johnes's tranſlation, the beſt edition of the "Chronicles" was that of Lyons in four volumes folio, 1559. The Engliſh reader is referred to Mr. Johnes's octavo edition of the Chronicle for farther particulars concerning Froiſſart: but in the "Memoirs of the Academy of Inſcriptions" there are many curious and intereſting particulars relative to his life and writings. Moreri. Johnes's edition of the Chronicles of England, France, &c. 8vo. 1805.

FROISSY, in *Geography*, a town of France, in the department of the Oiſe, and chief place of a canton in the diſtrict of Clermont; 5 miles S.S.W. of Breteuil. The place contains 663, and the canton 11,234 inhabitants, on a territory of 180 kiliometres, in 23 communes.

FROITZHEIM, a town of France, in the department of the Roer, and chief place of a canton in the diſtrict of Aix-la-Chapelle. The place contains 384, and the canton 8,156 inhabitants, in 30 communes.

FROLOIS, a town of France, in the department of the Côte d'Or; 21 miles N.W. of Dijon.

FROMAIL, a town of Walachia; 15 miles N.E. of Buchareſt.

FROMAGE, Peter, in *Biography*, diſtinguiſhed for his great exertions among the Catholic miſſionaries in the Eaſt, was born at Laon in the year 1678. In 1693 he entered the order of the Jeſuits, and on account of his ſubſequent proficiency he was ſelected by his ſuperiors to preſide over the claſſical ſtudies of their younger pupils. Having completed his theological courſe, he offered his ſervices as a miſſionary to the Levant; being approved, he was firſt ſent into Egypt, where he exerted all his powers in acquiring a knowledge of the Arabic language, nor was he leſs zealous in performing the duties attached to his different employments. He was afterwards ſent into Syria, where he ſpent the remainder of his life. Here he eſtabliſhed a printing preſs for the Arabic language, in the monaſtery of St. John, near Antura, a village in the chain of mountains diſtinguiſhed by the name of Anti-Libanus. Having procured the neceſſary types from Rome, he printed in Arabic a great number of theological and devotional pieces, which he took care to diſperſe through the country. Fromage was preſent at a ſynod of the Maronites held in 1736, and pronounced a diſcourſe at its opening, which is publiſhed with an account of the proceedings of the ſynod in the eighth volume of the "New Memoirs of the Miſſions of the Society of Jeſus in the Levant." Fromage died in the year 1740. Moreri.

FROME, in *Geography*, a river of England, in the county of Somerſet, which joins the Avon about 5 miles S.E. of Bath.—Alſo, a river of England, which runs into the Lug, near Hereford.—Alſo, a river of England, in the county of Dorſet, which paſſes by Dorcheſter, &c. and runs into the ſea in Poole harbour, a little below Wareham.—Alſo, a river of England, in the county of Glouceſter, which joins the Avon at Briſtol.—Alſo, a river of England, which runs into the Severn near Berkeley, in Glouceſterſhire.

Frome, or *Frome Selwood*, a large town in the hundred of Frome, Somerſetſhire, derives its firſt denomination from being ſituated on a river of that name, which riſing to the ſouth of the place, paſſes through it, takes a northerly direction, and falls into the Briſtol Avon, below Bradford, in the county of Wilts. The additional appellation it receives from the diſtrict which formerly conſtituted the extenſive and celebrated foreſt of Selwood. Leland deſcribes it as ſtanding upon the cliff of a ſtony hill, which is partially correct; for it is pleaſantly ſeated upon ſeveral abrupt hills, and at the bottom of one is the principal entrance by a good ſtone bridge of five arches over the river. The church is a handſome and ſpacious ſtructure, compriſing a nave, chancel, north and ſouth aiſles, chancel and four chapels, with a large ſquare embattled tower, ſurmounted by an octagonal ſpire, riſing 120 feet in height. Here are alſo ſix other places of worſhip for various denominations of proteſtant diſſenters. Near the bridge is a good free ſchool, and an alms-houſe for poor widows, erected by ſubſcription in 1720. Anciently in this pariſh a monaſtery was erected by Aldhelm, a monk, and biſhop of Sherborne; and ſubſequently a priory and nunnery, no veſtiges of which remain.

The town has greatly increaſed within a century paſt, and contains about 38 ſtreets, which are in general narrow, irregularly built of rough ſtones, and covered with heavy ſtone tile, dug in the adjacent quarries. By the returns made to parliament it appears that, in 1801, the town included 1653 houſes, and 8,748 inhabitants. But this eſtimate is glaringly defective. In 1724 it was conſidered as having more inhabitants than the city of Bath; and though it has not increaſed like that place of faſhionable reſort, yet, upon a moderate computation, one-third may be added to the number in the official return. Theſe are principally employed in the manufacturing of ſuperfine cloths and kerſeymeres, or in other branches of buſineſs connected with this ſtaple manufacture: the river affording facilities to the trade for the purpoſes of ſcouring, dying, erecting fulling and gig-mills, with other kinds of machinery. Frome was formerly governed by a bailiff, but at preſent the police is under the direction of the neighbouring magiſtrates, aided by two conſtables, annually choſen at the courts leet of the joint lords of the manor, the marquis of Bath, and the earl of Cork and Upper Oſſory. The latter nobleman has an elegant

feat at Marfton park, in the adjoining parifh, and the country is embellifhed with feveral handfome manfions in the vicinity. See Collinfon's Hiftory of Somerfetfhire.

FROMERIES, a town of France, in the department of the Somme; 7 miles S.W. of Poix.

FROMIGUERE, a town of France, in the department of the Eaft Pyrenees; 7 miles N. of Montlouis.

FROMISTA, a town of Spain, in the province of Leon; 18 miles N. of Palencia.

FROND, in *Botany*, (*Frons*, a leafy bough,) is a kind of ftem which is at the fame time a leaf, and bears the fructification. (See CAULIS and FRUCTIFICATION.) The term is exclufively appropriated to plants of the clafs *Cryptogamia*. Sprengel, in his letters on Cryptogamous Plants, feems not to have been aware of this, when he objects to its ufe, becaufe feveral plants of the other claffes bear their flowers on the leaf. Such indeed is the cafe in *Rufcus*, *Phyllanthus*, *Xylophylla*, &c; and even in *Turnera*, where the flower proceeds from the leaf-ftalk. But thefe examples do not prove the impropriety of the term in Cryptogamous plants, to which alone it is now applied. The fern tribe, (fee FILICES,) are good examples of a frond, as each plant confifts of a ftalked leaf, bearing the fructification either on its back, or in fpikes or clufters, which are evidently a metamorphofis of fome of its parts or lobes. Lichens alfo have a true frond, either in the form of a cruft, a leathery leafy expanfion, or a branched fhrubby fubftance, with each of which the fructification is intimately connected. Linnæus has erroneoufly ufed the term *frons* in the natural order of *Palmæ*, which, however lofty in their growth, have not the proper ftem of a tree, but are genuine herbaceous plants, whofe ftalks or ftems, not their leaves, bear the fructification, neither do they belong to the clafs *Cryptogamia*. This great obferver is however thus far juftified, that the depofition of wood in palms is exactly like that of ferns, and betrays a ftrong and peculiar affinity between them. Palms indeed are the connecting link between Ferns and the Liliaceous order.

FRONDES. See LEAF.

FRONDESCANTIA denotes the feafon of the year when the leaves of plants are unfolded.

FRONSAC, in *Geography*, a town of France, in the department of the Gironde, and chief place of a canton, in the diftrict of Libourne, feated on the Ille; two miles N. W. of Libourne. The place contains 1339, and the canton 13,348 inhabitants, on a territory of 165 kiliometres, in 22 communes. The fruitful tract at the junction of the Ille and Dordogne, oppofite to Libourne, on which this town is fituated, is called *Fronfaides*.

FRONT, the forehead, or that part of the face above the eye-brows.

The word is formed of the Latin *frons*; and that from the Greek φρονειν, *to think*, *perceive*; of φρεν, *mens*, *the mind*, *thought*. Martinius, to make out this etymology, obferves, that from the forehead of a perfon we perceive what he is, what he is capable of, and what he thinks of. Du Laurens chufes to derive it from *ferre*, becaufe it bears the marks of what we have in our head.

FRONT is alfo ufed where feveral perfons, or things, are ranged fide by fide, and fhew their front, or foreparts.

FRONT, in *Architecture*. The elevation of any of the exterior fides of the walls of a building is denominated a front. Buildings being generally conftructed of a rectangular form, have four fronts; the one that is beft finifhed is called the principal front, which is generally that through which the building is entered; and on this account is alfo called the entrance front. The oppofite front to the entrance is called the rear front; and the fronts on the fides are denominated flanks, which, in towns where the houfes join each other, are called party-walls.

FRONT, in *Fortification*. See FACE and TENAILLE.

FRONT *of a Regiment*, in *Military Language*, denotes the foremoft rank of a battalion, fquadron, or any other body of men.

To front every way, is when the men are faced to all fides. See FILE-*leaders*.

FRONT *of a Camp* is the line that determines its extent, and in which are placed the colours and ftandards of the troops that occupy the *camp*; which fee.

FRONT, in *Perfpective*, a projection or reprefentation of the face, or fore-part of an object, or of that part directly oppofite to the eye; called alfo, and more ufually, orthography.

FRONT, *Line of the*. See LINE.

FRONT *Scale*. See SCALE.

FRONT *Royal*, in *Geography*, a town of America, in Frederick county, Virginia, at the foot of the Blue Ridge, eight miles E. of Shenandoah river, and 20 miles S. of Winchefter. It contains about 90 houfes, a Prefbyterian church, and another for Methodifts. A refpectable German fchool is kept here.

FRONTAL, in *Architecture*, a little fronton or pediment, fometimes placed over a fmall door or window.

FRONTAL, *Frontlet*, or *Brow-band*, is alfo ufed in fpeaking of the Jewifh ceremonies.

This frontal confifts of four feveral pieces of vellum, on each whereof is written fome text of fcripture; they are all laid on a piece of black calf's leather, with thongs to tie it by. The Jews apply the leather with the vellum on their foreheads in the fynagogue, and tie it round the head with the thongs.

FRONTALE Os, in *Anatomy*. See *Os* FRONTIS.

FRONTALE, or *Frontal*, in *Medicine*, an external form of remedy, applied on the forehead and temples with a bandage, for the cure of the head-ache, megrim, vapours, defluxions on the eyes, &c. Frontals are compofed of rofes, elder flowers, betony, marjoram, lavender, camphire, &c. wrapped in a linen cloth, and applied over the forehead and temples.

There are alfo frontals, in manner of liniments, made of unguentum populeum and extract of opium, or of paftes, powders, feeds, &c.

In frontals applied to eafe the violence of the head-ache, in the heights of fevers, they frequently mix the kernels of cherries.

FRONTALIS, in *Anatomy*, a name given to feveral parts fituated about the frontal bone; as two hollows in the fubftance of the bone, a nerve, an artery, and a vein.

FRONTANA, in *Geography*, a town of Spain, in Catalonia; 25 miles S. E. of Urgel.

FRONTATED, a term ufed by *Botanifts* to exprefs that the petalum, or leaf of a flower, grows broader and broader, and at laft, perhaps, terminates in a right line, in oppofition to *cufpidated*, which expreffes that the leaves terminate in a point.

FRONTE, in *Geography*, a town of France, in the department of the Po, on the Marlon; 11 miles N. of Turin.

FRONTEAU, JOHN, in *Biography*, was born at Angers in the year 1614, and was educated by a parifh prieft in that neighbourhood, by whofe inftructions he profited fo well, that before he was thirteen years of age he could, with the

utmoſt facility, tranſlate his native language into the Latin and Greek. At the college of La Fleche he went through a courſe of philoſophy and his other advanced ſtudies, and in the year 1631 he took the habit of a canon regular in the houſe of All Saints at Angers. At St. Genevieve, in Paris, he was appointed to teach philoſophy, and in 1639 was appointed profeſſor of divinity, which he taught with high reputation for 12 years. In 1648 he was appointed chancellor of the univerſity of Paris, and obtained other valuable church preferments. He once incurred the diſpleaſure of the court on ſuſpicion of being a defender of, and attached to the Janſeniſts; but his ſubſequent conduct, and his readineſs to ſign the required teſt, raiſed him again into favour. He died in 1662, not many days after he was inducted into the priory of St. Magdalen of Montargis. He was author of many learned works, and a collection of his letters was publiſhed after his death. He was an able and diligent ſcholar; beſides the Latin and Greek languages, he was maſter of moſt of the modern, and all the oriental tongues. "He kept up," ſays Du Pin, "a large correſpondence, not only with the learned, but alſo with the moſt conſiderable perſons in the kingdom, and particularly with the moſt conſiderable men of the long robe, who honoured him with their friendſhip. In his works he knew how to adorn his profane reading by the eccleſiaſtical, and always enlivened the ſubject with ſome paſſages of the fathers, or with ſome curious hiſtorical notes and obſervations." Moreri. Du Pin.

FRONTEIRA, in *Geography*, a town of Portugal, in the province of Alentejo; ten miles N. of Eſtremos.

FRONTEITTEN, a town of Germany, in the duchy of Stiria; 14 miles N. N. W. of Gratz.

FRONTENHAUSEN, a town of Bavaria; 14 miles E. of Landſhut.

FRONTEVAUX, *Order of.* See FONTEVRAUD.

FRONTIER, the border, confine, or extreme of a kingdom, or province; which the enemies find in front, when they would enter the ſame. Thus we ſay, a frontier town, frontier province, &c. Frontiers were anciently called *marches*.

The word is derived from the French *frontiere*, and that of the Latin *frontaria*; as being a kind of front oppoſed to the enemy. Skinner derives frontier from *front*; inaſmuch as the frontier is the exterior, and moſt advanced part of a ſtate; as the front is that of the face of a man.

FRONTIGNAN, in *Geography*, a town of France, in the department of the Herault, and chief place of a canton in the diſtrict of Montpellier; 12 miles S.W. of Montpellier. This little town is ſituated on lake Maguellone, called alſo lake Thau, and is famous for its wine, generally called Frontigniac. The place contains 1,420, and the canton 3,032 inhabitants, on a territory of 205 kiliometres, in five communes.

FRONTIGNIAC WINE, is ſo called from a town of Languedoc, in France, mentioned in the preceding article, remarkable for producing it.

FRONTINAC, in *Geography*, a county of Upper Canada, bounded on the E. by the county of Leeds, on the S. by lake Ontario, on the W. by the townſhip of Erneſt, running N. 24° W. until it interſects the Ottawa or Grand river, and thence deſcending that river until it meets the north-weſternmoſt boundary of the county of Leeds.

FRONTINAC, *Fort*, a fortreſs in Canada, at the head of a fine bay or harbour, on the N.W. ſide of the outlet of lake Ontario, where veſſels of all ſorts may ride in ſafety. It is a league from the mouth of the lake, and at a ſhort diſtance S. of Kingſton, and about 300 miles from Quebec. The ſoil is ſo well cultivated about this place as to produce all ſorts of European and Indian corn and fruits. See ONTARIO.

FRONTINUS, SEXTUS-JULIUS, in *Biography*, an eminent Roman, and city prætor A.D. 70. He was afterwards a ſupplementary conſul, and diſtinguiſhed himſelf by his military talents as a commander in Britain. He is noticed by the younger Pliny and other writers for the benefit which his country derived from his talents. Under the emperor Nerva he was appointed to the ſuperintendance of the waters, and in this capacity he brought the water of the Anio to Rome by means of a ſplendid aqueduct. He wrote two books on the conſtruction of theſe works, by the emperor's expreſs order. He wrote likewiſe upon military ſtratagems, a work which is ſtill extant. The beſt edition of his works is that printed at Lyons 1731 and 1779. A work on agriculture, which has been aſcribed to him, was probably compoſed by a later writer. When Frontinus died he forbade the erection of a monument to his memory, ſaying that it was a ſuperfluous expence; for his name would live if he had done any thing to merit the honour. Gen. Biog.

FRONTIS, OS, in *Anatomy*, one of the bones of the head. See CRANIUM.

FRONTISPIECE, in *Architecture*, the portrait or principal face of a fine building.

The word is formed of the Latin *frontiſpicium*, q. d. *frontis hominis inſpectio*.

The frontiſpiece of the Louvre is the fineſt piece of architecture in France.

Hence, alſo, by a figure, we ſay, the frontiſpiece of a book, meaning an ornament, with an engraven title on the firſt page.

FRONTLET. See FRONTAL.

FRONTLET *Aim*, in *Gunnery*, is a piece of a plank three inches thick, a foot long, and ſeven or eight inches high, with a round cavity underneath to fit the outſide of the gun, and having a ſmall ſlit to ſee the object through it. It is placed upon the vent field of the gun, when it is pointed in a battery.

FRONTON, in *Architecture*, a French word uſed to expreſs an ornament over a door or a pediment. See PEDIMENT.

FRONTON, in *Geography*, a town of France, in the department of the Upper Garonne, and chief place of a canton in the diſtrict of Toulouſe; 15 miles N. of Toulouſe. The place contains 2,149, and the canton 11,708 inhabitants, on a territory of 247½ kiliometres, in 20 communes.

FROOGARDE, a town of Norway, in the dioceſe of Drontheim; 60 miles S.S.E. of Drontheim.

FROOKABOO, a town of Africa, in Bambarra. N. lat. 12° 45′. W. long. 5° 20′.

FROSASCO, a town of Italy, in the department of the Po; 13 miles S.W. of Turin.

FROSCHGRUN, a town of Germany, in the principality of Culmbach; 5 miles S.E. of Lichtenberg.

FROSCHIUS, JOHN, in *Biography*, a doctor in theology, and a prior of the order of Carmelites, at Augſburg; publiſhed in 1535 a treatiſe, entitled "Rerum Muſicarum Opuſculum rarum ac inſigne, totius ejus negotii rationem mira induſtria et brevitate complectens, jam recens publicatum, Joan Froſchio autore." Argentorati, 1535.

This work is divided into nineteen chapters, of which the firſt fourteen are chiefly employed in diviſions of the ſcale and theory of ſound, according to the doctrines of the ancients. Chap. 15. explains the notes in uſe during the early part of the ſixteenth century, as placed on lines and ſpaces; the

the characters for time and their proportions; perfection, imperfection, prolation, &c. There is but one chapter, the nineteenth and the laft, on the fubject of compofition, or the practice of harmony. The work is terminated with examples of counterpoint in four and fix parts; but being printed feparately, in old notation, and not regularly barred, they are fomewhat difficult to fcore.

FROSE, in *Geography*, a town of Germany, in the duchy of Magdeburg; 10 miles S. of Magdeburg.

FROSO, a fmall ifland on the E. fide of the gulf of Bothnia. N. lat. 63° 34'. E. long. 22° 14'.

FROSON, a town of Sweden, in Jamtland, fituated in an ifland in lake Storfio, containing a fchool and poft-office. N. lat. 63° 10'. E. long. 15°.

FROSSAY, a town of France, in the department of the Lower Loire; 4 miles S.E. of Painbœuf.

FROST, in *Meteorology*, fignifies that ftate of the atmofphere in which the thermometer is below 32°, and water becomes congealed.

When the fun paffes to the fouth of the equator, the northern hemifphere gradually lofes of its temperature, its expenditure of heat being greater than the fupply. After fome time a rapid diminution of temperature is obferved as we pafs over the fucceffive parallels of latitude from the equator to the North pole. As far as the action of the fun's rays is concerned, this decreafe of temperature fhould be regular; that is, it fhould be in fome proportion to the diftance from the equator, and to the progrefs of the feafon. We find however from experience, that fuch regularity does not take place. In any given northern latitude the temperature is more efpecially defultory in the winter feafon. Some other caufe therefore muft operate to produce this irregularity. This caufe is the winds. Not only are the winds more violent in the winter feafon, but they induce a greater change of temperature, all other circumftances the fame, than in any other feafon, by reafon of the contiguous climates being then more difproportionate than ufual in their temperature. See WIND and TEMPERATURE.

Mr. Kirwan remarks, that "it fcarce ever freezes in latitudes under 35°, unlefs in very elevated fituations." It is known indeed, that ice and fnow are perpetual, even under the equator; but then it is in very elevated and almoft inacceffible fituations. Above the latitude of 35°, froft is gradually more prevalent in the winter feafon, as we approach the pole. In Britain, froft commonly appears in the courfe of October and difappears in April; but the feverity of it is confined to December, January, and February. Such however is the uncertainty of froft in this country, that fome winters pafs over with fcarcely a week of keen froft, and the thermometer never lower than 20°; whilft in other winters we have 10 or 12 weeks of froft with little interruption, and the thermometer fometimes as low as the zero of Fahrenheit, or lower. This difference of feafons arifes from the wind being accidentally confined principally to the S.W. or to the N.E. direction, the former current coming from the equatorial, and the latter from the polar regions. It is obfervable that Britain, from its infular fituation, is lefs liable to extreme cold than the correfponding latitudes on the continent; but then its temperature is probably more fluctuating.

There are certain phenomena attending the natural congelation of water in ordinary frofts that deferve notice. Small portions of water, infulated, or cut off from the furface of the ground, are moft liable to be frozen. Becaufe the ground is comparatively a good conductor of heat, no body in contact with it can be frozen till the temperature is reduced all around. Air is generally the medium that poffeffes the freezing temperature; therefore the more completely any body is furrounded with air, and the lefs the connection it has with the earth, the more readily it is frozen. Ice is formed firft over fhallow pools of water, then over ponds, and laftly over lakes. The reafons are various. Earth has a lefs capacity for heat than water; it is therefore foon reduced and deprived of the heat which it fhould impart to the water in the firft cafe. But in deep waters the tardy congelation is principally owing to another caufe, in combination however with the former. Water is a liquid which increafes in fpecific gravity as its temperature diminifhes down to 36°. Now as it muft be cooled to 32° before it can freeze, it follows that the cooling of water at its furface cannot effect its congelation till the whole mafs is made to approximate the freezing temperature; becaufe the cooled water immediately tends downwards, and warmer water afcends.

Another reafon for the flow congelation of water is quite of a different kind from thofe already mentioned. It is a change of capacity of the water for heat. During congelation water lofes as much heat as would, if added, be fufficient to raife its temperature 140°. Of courfe it requires a long continued application of a cooling caufe to deprive the water of fo much heat. This fact was difcovered by Dr. Black; he called the heat fo difengaged *latent*, becaufe it did not affect the thermometer. The importance of this change of capacity of water in checking the feverity of winter, has been well elucidated by different authors, particularly by Crawford in his Effay on Animal Heat, and by count Rumford in one of his Effays on heat.

Springs of water are obferved to remain unfrozen for a great length of time, and to emit a fmoke or vapour. This is owing to their rifing from a great depth, and confequently partaking of the internal temperature, which is nearly uniform throughout the year, and the mean annual temperature. The water, comparatively warm, fends off fteam, which the cold air foon condenfes into a mift. See EVAPORATION and FOG.

Froft does not penetrate fo deep into the ground as might be expected. In Britain it feldom finks 10 or 12 inches; though in a very long froft it has been found 18 inches deep or more. In high northern latitudes, where the cold is more fevere, it does not penetrate proportionally; the reafon is, the ground is generally covered with fnow, which defends it from the action of the air. See SNOW.

The force with which water expands in the act of freezing is wonderful. Very ftrong veffels have been burft by the freezing of water within them. Mr. Boyle relates that a gun-barrel filled with water, then clofed and frozen, was burft the whole length. By a fimilar experiment Huygens burft a cannon. Major Williams made many experiments on the expanfive force of freezing water at Quebec in 1784 and 1785. He filled iron bomb-fhells of various fizes with water, then plugged the fuze-hole clofe up, and expofed them to a ftrong froft. The plugs were always thrown out with force, fometimes to the diftance of 400 or 500 feet, or the fhells burft, the ice at the fame time bolting out. Hence the effects of froft in fplitting rocks, burfting pipes, &c. are not fo much to be wondered at.

In fome countries, particularly Ruffia, meat is preferved for feveral months by means of froft.

A chronological record of fome of the moft remarkable frofts is fubjoined. See Hutton's Math. and Philof. Dict.

In the Year

220. Froft in Britain that lafted 5 months.
250. The Thames frozen 9 weeks.
291. Moft rivers in Britain frozen 6 weeks.
359. Severe froft in Scotland for 14 weeks.

508. The

In the Year
508. The rivers in Britain frozen for two months.
558. The Danube quite frozen over.
695. The Thames frozen 6 weeks; booths built on it.
759. Froft from October 1ft, till February 26th, 760.
827. Froft in England for 9 weeks.
859. Carriages ufed on the Adriatic fea.
908. Moft rivers in England frozen 2 months.
923. The Thames frozen 13 weeks.
987. Froft lafted 120 days; began December 22d.
998. The Thames frozen 5 weeks.
1035. Severe froft on June 24th; the corn and fruits deftroyed.
1063. The Thames frozen 14 weeks.
1076. Froft in England from November till April.
1114. Several wooden bridges carried away by ice.
1205. Froft from January 14th till March 22d.
1407. Froft that lafted 15 weeks.
1434. From November 24th to February 10th, Thames frozen down to Gravefend.
1683. Froft for 13 weeks.
1708-9. Severe froft for many weeks.
1715. The fame for many weeks.
1739. One for 9 weeks; began December 24th.
1742. Severe froft for many weeks.
1747. Severe froft in Ruffia.
1754. Severe one in England.
1760. The fame in Germany.
1776. The fame in England.
1788. Thames frozen below bridge; booths on it.
1795. Severe froft in England.

Frost, in *Phyfiology*, or as it regards the animal and vegetable kingdoms, is of great confideration. Clear frofty weather is accounted falubrious, when the cold is not extreme, and a due portion of exercife is taken. Extreme cold is fometimes known to freeze the parts of the body expofed. Lofs of fenfation in the parts is the confequence, and if not fpeedily attended to, mortification enfues. Rubbing the affected parts with fnow is faid to be the beft remedy. It is remarkable that perfons expofed to great cold are ftrongly inclined to fleep; this fymptom therefore fhould be confidered as alarming, and due care fhould be taken by keeping the fatal confequence in view.

Frost, in *Agriculture* and *Gardening*, is beneficial in the winter feafon. It expands the foil, renders it more loofe and friable, and adapts it for tillage; it deftroys grubs and other infects which are injurious to vegetation. On the other hand, in an early fpring, when vegetation has advanced too rapidly, the effects of froft have fometimes been highly deleterious. What are called *blights* are moft frequently occafioned by froft. It often happens, that warm weather in April and May is accompanied with thunder, and this is fucceeded by a week or two of cold frofty weather. After fome nights more feverely cold, when the thermometer has been at or near freezing, the blight appears. It has been afcribed in fuch cafes to the lightning; but it is clearly an effect from an oppofite caufe. Experienced gardeners inform us that the beft remedy for blights in vegetation, fuch for inftance as in the young fhoots of potatoes, is to cut off the part affected, which otherwife, like a gangrene, fpreads the diforganization. See Blight.

Frost, *Hoar*, is the dew frozen on the grafs, on trees, or on the furface of any other body. This phenomenon, which is conftantly obfervable in frofty weather, is notwithftanding more particularly an object of notice in autumn. The reafon is, it is more abundant then, and frequently unaccompanied with other figns of froft, as ice and fnow. Vapour at that feafon is copious, and dews ftrong. The cold is not yet fufficiently powerful to freeze a body of water in contact with the earth; but the dew, being fmall drops of water infulated, or refting lightly on the grafs, requires lefs cold to congeal it. There is a remarkable appearance of hoar-froft when a thaw commences after a long froft. Houfes, walls, &c. which during the froft feemed unaffected, are fuddenly covered with a thick coating of hoar-froft. It is the walls, which retaining the previous temperature for fome time, condenfe the vapour introduced by the thaw into hoar-froft.

Frost, *Effects of, on Land, Plants, Trees*, &c. The operation of freezing is found to have confiderable effects not only in breaking down, reducing, and mellowing the particles of ftiff, adhefive, heavy foils, but alfo on the juices, fruits, and other parts of plants and trees.

It is confequently obvious, that wherever lands are of an obftinate, harfh, ftiff, clayey quality, much advantage may be derived from the practice of laying them up in ridges, in order that they may be expofed to the action and influence of froft during the winter feafon. The work of ploughing them up fhould be performed late in the autumnal feafon, juft before the froft ufually fets in, that they may afford their fulleft effects. In many cafes a fine tilth may be obtained in this way without any fpring ploughing, the ground being merely reduced by the fcuffler at the time of putting in the feed, which is a great faving of both labour and expence.

The action of froft is feldom much wanted on the light, fandy friable foils, as it may render them too open and porous for producing good crops, and thereby do great mifchief. It is very feldom that corn crops are in any way injured by hard winters, efpecially where the land has been perfectly drained, and is in any degree covered with fnow. But they are highly deftructive of great numbers of different kinds of infects, grubs, and other forts of vermin; while, at the fame time, by leaving the earth in a fine, loofe, powdery ftate, they fit it in the beft manner for the fpreading of the roots, by which, as the warmth of the fpring approaches, ftrong healthy plants are produced, and of courfe abundant crops. On the contrary, when frequent rain falls in the winter feafon without froft, the earth is foddened, fo as to produce afterwards little or nothing of good grain, but plenty of blades, which are liable to be foon deftroyed by the hoar frofts of the fpring, by infects, or by the choaking of weeds; or which, if they efcape, yield ftraw in the place of grain.

The cafe in which the greateft danger is to be apprehended from froft, is where the ground is inclined to be wet, and where there is no covering of fnow upon it. For inftance, where a fharp froft fets in after a fudden thaw, the fibres of the roots are liable to be burft or broken by the expanfion which is produced by the too abundant moifture of the plants, and perhaps that which furrounds them.

Froft is found to have much power in the ripening of grain and fruits of different kinds. It has been ftated by the author of "Minutes of Agriculture," for the year 1785, that the barley had not ripened perceptibly for fome weeks before the fharp frofts, fince which it has ripened daily. There are, it is continued, twice the number of ripe ears now there were a week ago; they are not only changed as to colour, but the corn is obvioufly plumper. Before the frofts, the heads feemed flender and puny; fo much fo, that he had configned the whole to the miller; now he begins to hope that fome of it may, this year of fcarcity, be fit for the maltfter. And it is added, that it was a general obfervation in this country, that in the fame year, (a wet backward

backward fummer,) the late ripe crops did not ripen until froft came; even wheat was out in December. It is afked, how this is to be explained? Froft can, it is fuppofed fcarcely to be doubted, comprefs the fap-veffels of vegetables, and probably force the fap out of them back to the earth, as is commonly fuppofed; but perhaps the natural receptacles of the plants are firft fupplied. It is readily obfervable, that fruits ripen, leaves fall, and that lattermath fhrinks by the action of froft.

And it has been noticed by Dr. Darwin, that the ripening of fruit and feed is often delayed from the want of a due evaporation of their perfpirable matter, and that of folar light in cloudy weather; hence, in the northern parts of the ifland, the oats are found to feldom ripen before the froft commences, with the dry feafon that ufually attends it.

Though the effects of frofts on trees and other vegetable productions have long been known, the differences between fuch as take place in fevere winters, and thofe which happen in the mornings during the fpring feafon, were never fully underftood, till explained in the Memoirs of the Academy at Paris by M. Du Hamel, and M. De Buffon.

The frofts of fevere winters have been found much more powerful in deftroying all forts of tender vegetable productions, though they occur much more rarely, than thofe of the fpring, which are, neverthelefs, very injurious, by the conftancy and frequency of their happening. The principal difference with refpect to trees is, that the frofts of fevere winters affect the wood of the trunks and large branches, while thofe of the fpring are chiefly hurtful to the buds and other tender parts.

Befides, the common winter frofts taking place at a time of the year when moft of the trees in woods and other places have neither leaves, flowers, nor fruits upon them, and when their buds are in fuch a ftate of torpor as not to be eafily injured, efpecially when the preceding fummer has not been over-moift, they feldom, under common circumftances, prove in any high degree deftructive to them. It is only the fevere frofts that happen late in the winter that do great mifchief, even to fuch trees as they do not wholly deftroy. The injuries which trees are ftated to receive in this way are, long cracks in the direction of the fibres, portions of dead wood inclofed by fuch as is yet in a living ftate, and that affection which is known to woodmen under the title of the double blea, which is a perfect circle of blue or foft white wood, that, when the tree is afterwards cut down, is found to be covered by a circle of hard folid wood.

The blea, in its natural ftate, is an outer circle of white and imperfect wood encompaffing the hard and more perfect wood of the tree, and furrounded by the bark, being eafily diftinguifhed in moft fpecies from the hard wood or heart of the tree, by its different colour, and want of hardnefs or folidity. See Albumen.

The celebrated M. Reaumur made long fince a great number of obfervations on the blea in trees of different parts of France, all which tended to fhew the falfe blea under the fame number of annual circles of the after-growth of the trees, which, on being counted, proved exactly as many as the number of years fince 1709; whence he naturally concluded, that all the falfe blea he found throughout the kingdom was the effect of the feverity of this one hard winter.

It is alfo further fuppofed evident, that this falfe blea is that part of the tree which, in the above year, was the true and natural blea, and which the feverity of the frofts of that winter prevented from ever becoming found and folid wood, leaving it to become more weak and defective for a fucceffion of years; during which the feveral annual circles of fupervening blea all became found and perfect wood in their natural courfe. And it is fufficiently obvious, that the blea muft be that part of the wood which is moft expofed to fuffer, in confequence of its being the outer wood of all, and that which forms a covering for the inner part. It may likewife be added, that it is naturally of a much lefs compact texture, and is much more replete with juices for the froft to exert its action upon.

The fplitting of trees in the direction of their fibres often takes place with a very loud crack or report. It is far from being uncommon in large forefts to meet with trees that have fuffered in this way, and which having outlived the feverity of the winter's froft that produced them, are found to have a long fort of ridges or ribs, marking the places where the cracks originally were, and forming a kind of cicatrices or fcars over them. Thefe cicatrices or ribs are, however, only fuperficial, as wherever they are, the cracks are ftill found remaining under them in the trees; for though the bark and blea can unite and confolidate in this manner, fo as to conftitute coverings for them, the fibres of the folid wood, when once broken and feparated, never clofe again. Woodmen are moftly of opinion, that all fuch cracks in timber are produced by frofts; and it is eafy to conceive this to be the cafe from the confideration of the vaft expanfive form which they caufe in all frozen liquids. See Freezing.

It is not, however, by any means afcertained, that all the different cracks in trees of the timber kind are the effects of froft: it is not improbable but that fome of them may depend upon other caufes, as a redundance of fap, &c.

With refpect to the difference of the expofures of trees, in regard to the effects of froft, there has been a variety of opinions held forth, but probably without having any foundation in juft obfervation. A great number of perfons fuppofe that the effects of froft are the more fevere on fuch as have a northern expofure, while others imagine a fouthern or weftern afpect to be the moft powerfully affected by it. There can be little doubt but that northern expofures are the moft cold; but ftill it is not to be concluded, that the effects of frofts on trees, in fuch afpects, are the greateft and moft injurious to them; on the contrary, there are numerous proofs that fhew it to be on the fouthern fides that trees in general are the moft cut and injured by them; and it is well known, from repeated trials, that there are particular accidents or conditions under which a more moderate froft may do greater injury to trees and other vegetables, than the moft fevere one that may happen to them, when under more favourable circumftances.

Early peas, and fome other forward crops, are frequently, in moft fituations, the moft expofed to danger, where they have eaftern expofures, and where there are alternate frofts and thaws, as the winds from that quarter are apt, in fuch cafes, to bring with them a portion of muriatic acid, which readily turns the crops black, and wholly deftroys them.

It was alfo found from the reports of the injuries which trees received during the fevere frofts of the year 1709, that they were by far the greateft where repeated falfe thaws took place and were fucceeded by a repetition of new frofts. And fpring frofts alfo afford numerous inftances of the fame thing. The experiments of M. de Buffon likewife inconteftibly fhew, that it is not the fevereft cold, or the moft fixed froft that proves the moft injurious to vegetable productions. This, however contrary to the commonly received opinion, is not by any means the lefs true or lefs confiftent with reafon. It has been found by numerous experiments that

that it is principally humidity that renders froſt ſo fatal and deſtructive to vegetables; conſequently, every thing that has a tendency to produce this ſtate in them muſt neceſſarily expoſe them to its injurious effects; while ſuch things as can prevent, or take off, an over proportion of moiſture in them, as every thing that has the tendency of drying them, whatever the increaſed degree of cold produced may be, muſt prevent or preſerve them from its injurious influence and operation. There is a variety of facts that tend to prove this. It is well known that vegetables conſtantly experience the effects of froſt, the moſt ſeverely in low, damp ſituations that are ſubject to fogs. Plants which ſtand by the ſides of rivers are frequently found deſtroyed by ſpring froſts as well as thoſe in autumn, while ſuch of the ſame kinds as ſtand in drier ſituations ſuffer little, if at all, by them. The low and wet parts of foreſts are likewiſe well known to produce worſe wood than the high and ſuch as are drier; and coppice wood in low, moiſt places of common woods, though it may puſh out more vigorouſly at firſt than that of other parts, never comes to ſo good a growth, as the froſts in the ſpring kill theſe early top-ſhoots, and oblige the lower parts of the trees to throw out lateral branches; the ſame thing likewiſe happens, in a higher or lower degree, to ſuch coppice wood as grows under cover of larger trees in foreſts; as in this caſe the vapours, not being carried off either by the ſun or wind, ſtagnate and freeze, deſtroying the young ſhoots in exactly the ſame manner as the fogs and damps of marſhy places. It has been long a common remark with horticulturiſts, that froſt is never hurtful to the late ſhoots of the vine, or to the flower-buds of trees, except when it immediately ſucceeds heavy dews or a long continued rainy ſeaſon, in which caſes it ſeldom or ever fails to do great miſchief, though ever ſo ſlight. The injurious effects of froſt are likewiſe conſtantly found to be more ſevere on the crops in newly cultivated lands, than under the contrary circumſtances, which is probably owing to the greater exhalation of moiſture from the ſurface. Such trees alſo as have been recently cut, are found to ſuffer more than others by the ſpring froſts, in conſequence probably of their ſhooting out more vigorouſly.

It has not unfrequently been remarked that the ſide ſhoots of trees are more liable to periſh by ſpring froſts than thoſe from the tops. Indeed M. de Buffon, who examined this point with great accuracy and minuteneſs, conſtantly found the effects of ſpring froſts to be much greater near the ſurface of the ground than elſewhere. The ſhoots within a foot of it were quickly deſtroyed by them; while thoſe at two or three feet in height bore them far better, and ſuch as were at four feet and upwards often wholly eſcaped unhurt, at the time that the lower ones were completely deſtroyed.

The whole of the facts on this ſubject tends, therefore, to ſhew, that it is not ſo much the ſeverity of froſts that proves injurious to trees and other vegetable productions, as that of their being replete with moiſture at the time it occurs. It is on this principle that the great damages done by ſevere froſts on the ſouth ſide of trees are to be explained, though that ſide may all the while have been expoſed to leſs cold than that of the north. Great injury is often done to the weſtern ſides of trees and plantations, as ſhewn in the Memoirs of the Academy of Sciences at Paris for the year 1737, when after a rain with a weſt wind, that wind turns to the north at ſun-ſet, as is not unfrequently the caſe in ſpring; or when an eaſt wind blows upon a thick fog before the ſun riſes.

Frost-*ſplit*, in *Agriculture*, is a term employed by farmers to denote certain effects of froſt on trees, ſuch for inſtance as thoſe of producing large cracks and fiſſures in their trunks and branches, which render them unfit for ſuch uſes as they would otherwiſe have been ſuitable for, and conſequently greatly deteriorate and leſſen their value as timber. Though it may have been contended by ſome that theſe effects on trees proceed from other cauſes than froſt, there are innumerable well authenticated inſtances of its power, when ſevere, of injuring the ſtrongeſt trees in this way. And there can be little doubt, when its very powerful expanſive action is conſidered, of ſuch rents and cracks really ariſing from froſt. See Frost.

FROTH, a white, light ſubſtance, formed on the ſurface of fluids by vehement agitation.

Froth conſiſts wholly of little ſpherules, or globules; and, accordingly, may be defined, an aſſemblage of aqueo-aereal bubbles.

Froth, in the *Manege*, is a moiſt white matter that oozes from a horſe's mouth, otherwiſe called foam. A horſe that by champing on his bridle, throws out a great deal of froth, is judged to be a horſe of mettle and health, and to have a cold freſh mouth.

Froth-*ſpit*, or *Cuckow-ſpit*, a name given to a ſort of white froth, or ſpume, very common in the ſpring and firſt months of the ſummer, on the leaves of certain plants, particularly on thoſe of the common white field-lychnis, or catch-fly, thence called by ſome *ſpatling-poppy*. All writers on vegetables have taken notice of this froth, though few have underſtood the cauſe or origin of it, till of late. Many imagined it an exhalation from the earth; ſome have eſteemed it, as its name expreſſes, the ſaliva of the cuckow; others, the extravaſated juices of the plant, and ſome a hardened dew. But all theſe are erroneous opinions, and the account of it is, that it owes its origin to a ſmall inſect, called by ſome the flea-graſs-hopper, which applies its anus cloſe to the leaf, and diſcharges upon it a ſmall drop of a white viſcous fluid, containing ſome air in it, and, therefore, ſoon elevated into a bubble. Before this is well formed, it depoſits ſuch another drop, and ſo on, till it is every way overwhelmed with a quantity of theſe bubbles, which form this froth. See Cuckow-*ſpit*.

FROUARD, in *Geography*, a town of France, in the department of the Meurthe, ſeated on the Moſelle; four miles N. N. W. of Nancy.

FROULAY-TESSE, a town of France, in the department of the Orne; ſeven miles S. E. of Domfront.

FROUNCE, in the *Manege*, a diſeaſe in horſes, when ſmall warts or pimples ariſe in the midſt of the palate, which are very ſoft and ſore, and ſometimes breed in the lips and tongue.

This diſorder is occaſioned many ways; ſometimes by eating wet hay, whereon rats or other vermin have diſcharged urine; by drawing frozen duſt into their mouths among the graſs, &c.

As to the method of treatment, it conſiſts in letting them blood in the two largeſt veins under the tongue, and waſhing the ſores with vinegar and ſalt, or with ale and ſalt, till they bleed.

Frounce, in *Falconry*, a diſeaſe incident to hawks, ariſing from moiſt and cold humours falling down to the palate and root of the tongue; by which means they loſe their appetite, and cannot cloſe their clap. Waſhing with alum-water, lemon-juice, &c. is held good for it.

FROUQUIE, in *Geography*, a ſmall iſland in the Engliſh channel, about one mile from the W. coaſt of the iſland of Jerſey.

FROW-Fish, in *Ichthyology*, the Cyprinus *orpus*, which ſee.

FROWARD, Cape, in *Geography*, a cape on the N. coaſt

N. coaſt of the ſtraits of Magellan. S. lat. 54° 3′. W. long. 7° 59′.

FROWER, an edged tool, uſed in cleaving wood into laths.

FROWEY Timber, is that which is of the ſame degree of texture throughout, and that which works freely.

FROWSACK Channel, or the gut of Canſo, in *Geography*, a ſtrait between Nova Scotia and Cape Breton iſland, five French leagues long, and one broad.

FROYEN, an iſland in the North ſea, near the coaſt of Norway, about 35 miles in circumference. N. lat. 63° 45′. E. long. 9°.

FROZELIN, a ſmall town of France, in the department of the Creuſe, N. W. of Gueret, at the conflux of the Great and Little Creuſe.

FROZEN, or Frigid *Zone*. See Zone.

Frozen, or *Northern Ocean*, *Mare Hyperboreum*, or *Mare Scythicum*, extends from 52° or 53° N. lat. to the polar region. Between the eaſtern coaſts of Great Britain and the coaſts of Denmark and Norway, northward to the Shetland iſlands, it forms a gulf called the "German ſea." At the ſouthern extremity of Norway, an arm of that ſea almoſt environs Denmark; ſtretching eaſt and north-eaſt, it is called the "Baltic," (which ſee,) and extends from ſouth to north 300 leagues, including the gulf of Bothnia. The ſmall gulfs of Finland and Livonia lie to the eaſtward; and the former, by means of the Ladoga and Onega lakes, has a communication with the White ſea. Theſe gulfs receive the Oder, the Viſtula, the Niemen, and the Dwina, together with many rivers which deſcend from Lapland and Sweden, Finland and Livonia. An inland gulf, eaſtward from Ruſſian Lapland, is called the "White Sea," (which ſee,) into which 12 or 13 conſiderable rivers diſcharge themſelves. At the N.W. extremity of Ruſſia, the ſtrait of Waygatz in 70° N. lat., was long conſidered by geographers as a paſſage into the ſea, or gulf, that lies eaſtward along the coaſt of Grand Tartary; but the navigation of this ſtrait is now found to be impracticable, on account of the ſhoals of ice floating in thoſe parts. To paſs into the eaſtern ocean by the north of Nova Zembla is equally impoſſible, becauſe an immenſe field of ice precludes all acceſs, in this way, from Europe to the Eaſt Indies.

From North Cape in Lapland the frozen ocean ſtretches weſtward along the coaſt of Greenland; repelled by the coaſt of Labrador, it turns northward to form an immenſe gulf, large tracts of which are diſtinguiſhed by different names, as Hudſon's Bay, Davis's Strait, and Baffin's Bay.

The diſtance between North Cape, and the N. E. extremity of Tartary, is about 155 degrees or 3300 Engliſh miles. A line from that extremity acroſs the Caſpian and Red ſeas, to the Cape of Good Hope, as Mr. Buffon obſerves, is about 3,600 Pariſian leagues; and no other line of equal extent is to be found in the old continent. From North Cape to the ſouth extremity of Africa are 2,500 leagues.

The frozen ſea was, by the Goths, called Gandawyk, by the Cimbrians Mare Maruſa, and by the Latins, Mare Sarmaticum, and Mare Scythicum. The Ruſſians now call it Ledovitoë Mare; by the Swedes it is denominated Is-Hafoet, and by the Norwegians Leberſec. It borders the whole of the northern part of the Ruſſian empire from the confines of Lapland to the Tſchukotſkoy Noſs; that is, from 50 to 205 degrees of longitude, and conſequently waſhes the ſhores of the governments of Archangel, Tobolſk, and Irkutſk. Several conſiderable bays are formed by this vaſt ocean; the greateſt of which is the "White ſea," already mentioned, extending from N. to S. within the land, from 69° to 63° N. lat., and containing a multitude of petty iſlands. Of the numerous iſlands in this ocean the moſt conſiderable are Nova Zembla and Kalgueva; both uninhabited or frequented only by fiſhermen and hunters. In this great ſea, conſidered as the boundary of the Ruſſian empire weſtward, there are only three harbours whence at this time any navigation is purſued, *viz.* Kolâ, Archangel, and Meſen: but that of Archangel is the moſt famous. The ſhores in many places, more eſpecially thoſe of the White ſea, are beſet with rocks; in other parts low, with ſhoals which, in a manner, forbid acceſs, and the adjacent country is very marſhy. The water in this ſea is proportionally not very ſaline, though near Archangel it is ſo briny, that ſome quantities of common ſalt are prepared from it. The ebb and flow are moderate, and in the parts lying moſt to the north ſcarcely perceptible. The fiſhery is very conſiderable, particularly of ſtock-fiſh, herrings, whales, morſes, porpoiſes, ſea-dogs, &c. See Ocean.

Frozen *Water*. See Water.

FROZES, in *Geography*, a town of France, in the department of the Vienne; 5 miles W. of Poictiers.

FRUCHILAN, a ſmall iſland, near the Weſt coaſt of Scotland. N. lat. 58° 3′. W. long. 5° 10′.

FRUCTIFEROUS properly denotes any thing that produces fruit; but in a more large and figurative ſenſe, is uſed by lord Bacon, and others, for ſuch experiments in natural philoſophy as prove advantageous to the experimenter in point of gain or profit.

FRUCTIFICATION, in *Botany*, is uſed not only to expreſs the ſtate of a plant bearing flowers or fruit, but alſo for all the parts collectively deſtined to the production of ſeed. Theſe organs are therefore, though temporary, and often very tranſitory, of the moſt eſſential importance. By them "each ſpecies is perpetually renewed without limits, ſo far at leaſt as the obſervation of mankind has reached; while all other modes of propagation are but the extenſion of an individual, and ſooner or later terminate in its total extinction." See Linnæus on the Sexes of Plants, p. 45, note, and Smith's Introduction to Botany, 240. "The fructification," ſays Linnæus in *Philoſophia Botanica*, 52, "is a temporary part of vegetables, deſtined for the reproduction of the ſpecies, terminating the old individual and beginning the new." He juſtly conſiders the herbage, or external form of all plants, as merely a ſort of maſk or clothing, by no means indicative of their true nature or character, which are developed in the flower and fruit. Pliny had already obſerved that "bloſſoms are the joy of trees, in bearing which they aſſume a new aſpect, vyeing with each other in the luxuriance and variety of their colours." This idea is juſtly extended by Linnæus to all plants in general, and hence he deduces the importance of the parts of fructification for the purpoſes of ſcientific arrangement, a principle firſt ſuggeſted by the celebrated Conrad Geſner towards the middle of the 16th century, and which all ſyſtematic botaniſts have ever ſince kept in view. Without it the ſcience of botany would long ago have relapſed into utter barbariſm.

Linnæus diſtinguiſhes ſeven parts of fructification, ſome of which are eſſential to the very nature of a flower or fruit, others not ſo indiſpenſably neceſſary, and therefore not univerſal. Beginning at the external part of a flower, and proceeding inwards, theſe ſeven parts preſent themſelves in the following order. *Calyx*, *Corolla*, *Stamen*, or *Stamina*, *Piſtillum* or *Piſtilla*, *Pericarpium*, *Semen*, and *Receptaculum*.

1. *Calyx*, the Calyx or flower-cup, generally resembles the leaves in texture and colour, and constitutes the external covering of the blossom. It is not always present, not being essential to a flower, whose necessary functions are independent of it. See Calyx.

2. *Corolla*, the Corolla, composed of one or more petals, always internal with respect to the calyx, and usually more delicate in texture, and more beautifully or variously coloured than that part, as well as differently scented. This organ, however, is not more universal or essential than the foregoing. See Corolla.

3. *Stamen* or *Stamina*, the Stamen or Stamens, which are the male organs, and therefore essential to every plant. These are commonly of a slender or thread-like form, ranged internally with respect to the corolla, and often inserted upon it, each bearing some kind of cellular body called the anther, which is the only important part, as producing the pollen or impregnating matter. See Fecundation *of Plants*.

4. *Pistillum* or *Pistilla*, the Pistil or Pistils, situated in the centre of the flower, which are the female organs, and therefore no less essential than the stamens, though not always stationed in the same individual flower with them. They consist of the germen, or rudiments of the fruit, the style or styles, and the stigma or stigmas; the first and the last only being necessary, as the style, serving merely to elevate the stigma more or less, is frequently dispensed with.

5. *Pericarpium*, the Seed-vessel, of a pulpy, woody or leathery texture, when present encloses and protects the seeds, but is wanting in many tribes of plants.

6. *Semen*, the Seed, to the formation and perfection of which all the other parts are subservient.

7. *Receptaculum*, the Receptacle, basis, or point of connection. This must be present in some form or other, and in compound flowers especially is very remarkable.

The nature and physiology of these parts will be found under several heads in their proper places, where also the varieties of structure in each will be explained.

Linnæus rightly calculates that the various combinations of which these seven parts are capable, must be sufficient to afford generic characters for all the genera of plants which have been, or can be, discovered; especially if we take into consideration the peculiarities of structure by which one or other of them is, in many cases, distinguished, and which afford the most decisive and essential marks. The fructification therefore is our only resource for the distinctive characters of genera, as well as of classes and orders, whether natural or artificial. It also frequently affords discriminating characters of species in a natural genus, though for these last the inflorescence and the herbage are, for the most part, more conveniently resorted to. Botanists of the old French school more especially, and others who have not sufficiently cultivated the principles of true Linnæan science, are frequently tempted to have recourse to the inflorescence in their generic characters, and even Linnæus was misled by his friend Artedi to commit the same fault in the arrangement of the natural order of *umbellatæ*. This has not yet been well corrected, though some of his adversaries have pointed it out. We are persuaded that the proper parts of fructification are in themselves all-sufficient, though it may, in many instances, require great acuteness to detect what is most certain and natural for the desired purpose, and to avoid prolixity in our definitions, while we indicate all that is essential.

The fructification of some natural orders of plants was so obscure at the time when Linnæus wrote, that he was obliged to found his class *Cryptogamia* in order to give them any place in his system. This is still the case with ferns more especially, (see Filices,) as well as with the aquatic *Algæ*. The fructification of mosses and lichens is now better understood, as will be explained in the proper place of each order.

FRUCTISTÆ. See Botany.

FRUGA, in *Geography*, a town of Africa; 20 miles S.S.E. of Morocco.

FRUGES, a town of France, in the department of the straits of Calais, and chief place of a canton in the district of Montreuil; 12 miles S.W. of Arras. The place contains 2,700, and the canton 12,843 inhabitants, on a territory of 185 kiliometres, in 25 communes.

FRUGIVOROUS Birds, are such as feed on fruits; either wholly or in part.

The frugivorous, according to Mr. Willughby, are a species of terrestrial birds, some of which have crooked bills and claws, yet are of gentler nature, and not rapacious. Such are the parrot kind; which, though sometimes carnivorous, yet feed likewise on fruit.

FRUGONI, Carlo-Innocenzo, in *Biography*, was born of a noble family at Genoa in 1692. At the age of sixteen he was persuaded, but much against his will, to enter into a monastic life. He taught classical literature for many years in several of the cities of Italy, and at the age of thirty-five, through the interference of cardinal Bentivoglio, he was liberated from his vows, which never sat easy on him, by pope Clement XII. He now obtained the patronage of the house of Farnese, who gave him an honourable asylum in Parma. When the duke established an academy of Fine Arts, Frugoni was employed to draw up its statutes, and was made the perpetual secretary. He was also appointed court-poet, and inspector of theatrical exhibitions, and pensions and honours were liberally bestowed on him. He died at Parma in the winter of 1768. He is distinguished in Italian history as a considerable poet, and he maintained his reputation for vivacity and the fire of genius to a very advanced age. He excelled in various styles and modes of composition; his printed works consist of sonnets, odes, canzoni, elegies, satires, eclogues and epistles. He had, in almost all he did, a style and manner peculiar to himself, but his lyric poetry is the most highly esteemed, and in this he was scarcely ever surpassed by any of his countrymen. His works were collected and published in nine volumes 8vo. in the year 1779. In private life he was open and undisguised, cheerful and pleasant in conversation, but sometimes sarcastical, and more disposed to talk of himself than to praise others. In some of his features he is said to have resembled the immortal Tasso.

FRUHITAN, in *Geography*, an island near the W. coast of Ireland; 3 miles W. of Masa point.

FRUIT, in its general sense, includes whatever the earth produces for the nourishment and support of animals; as herbs, grain, pulse, hay, corn, flax, and every thing expressed by the Latins under the name *fruges*.

In the *civil law*, they distinguish three kinds of fruits, *viz.*: *natural*, which the earth produces spontaneously, and without any culture; as those of trees; *fruits of industry*, which, though natural, require some culture to perfect them: and *civil*, which are only fruits in the eye of law; as rents, salaries, wages, &c.

In the *canon law*, fruits include every thing whereof the revenue of a benefice consists; as glebe-land, tythes, rents, offerings, mills, &c.

Fruit, *Fructus*, in *Botany* and *Vegetable Physiology*, that part

part of the fructification of plants which follows the flower, and comprehends the feed. All the parts of the flower are fubfervient to the formation, impregnation, and perfection of the fruit, which is deftined to be the fource of a new progeny, and moftly formed fo as, by various means, to promote its difperfion. All fruits are fo conftructed as, in the firft place, to protect the young embryo, to nourifh its growth, and to convey to it, by appropriate veffels, the influence of the pollen by which it is impregnated. When the feed is arrived at maturity, the very fame parts undertake a new and even contrary office, either expofing it and letting it go, or ferving by their own ftructure and altered nature to convey it far away from its place of birth. The ftricteft connections are all diffolved, and even mechanical force employed to accomplifh the great ends of its formation.

The fruit confifts of the *Pericarpium* or Seed-veffel, and the feed which it contains. Some botanifts contend that there is no fuch thing as a feed truly naked, or deftitute of a *pericarpium*, which is the opinion of M. Richard in his *Analyfe du fruit*, publifhed at Paris in 1808, by M. Duval. This is fo far true in a phyfiological fenfe, that every feed muft have an external coat or covering; but this coat is not more decided nor complex in what are commonly termed naked feeds, as thofe of graffes and the order *Gymnofpermia* of Linnæus's 14th clafs, than in feeds enclofed in a true *pericarpium*. For botanical diftinctions the difference between naked and covered feeds is ufually clear and eafy, though in fome inftances the Linnæan generic definitions may be incorrect in this point, as taking a dry berry or drupa for a naked feed. Analogy, or a regard to natural affinities, will commonly prove fufficient to guard us againft this error. If any feeds may be faid to be truly naked, they are thofe of the natural order of graffes in general. To thefe M. Richard feems to allude, p. 25. "Among feeds prefumed to be naked," fays he, "fome have a pericarp very diftinct from the proper integument of the feed; in others thefe two parts adhere fo firmly together, that they appear to conftitute one fimple covering. The firft may very eafily be arranged in the feries of fruits, but the miftake refpecting the latter will be fo much the more difficult to remove, as it is protected by an obfcurity of connection in the parts, almoft impenetrable to a mere botanical examination. If however we have recourfe to phyfiological anatomy, and efpecially to natural affinities, this error may be attacked with advantage, being condemned by reafon, though excufed by the fenfes." He then lays down as a rule that "every thing in a ripe fruit which is external to the proper integument of a feed belongs to the pericarp." This no one can controvert, the only queftion being what is fuch integument. In graffes nothing can be more fimple than this part, and we cannot but reft content with that evidence of the fenfes which tells us a grain of wheat has no real *pericarpium*. We are neverthelefs aware of the importance of a maxim, too much neglected in the Linnæan fchool, that in many cafes the true nature and ftructure of a fruit can be known only by examining it in two or more progreffive ftates of growth. By this means we attain a knowledge of the real number of cells, in fome *Jafmineæ* for inftance, which are beft determined in the germen, fome of them, perhaps all but one, being obliterated in the fruit. This happens in fome fpecies of *Chionanthus*, which ripen but one of their four feeds, while others ripen two, or perhaps the whole four. Hence this genus has been improperly fubdivided by thofe who have examined the ripe fruit only. In general all fruits that finally become pulpy are beft underftood by examination when half grown, while thofe of a capfular nature fhew their true ftructure as they advance towards maturity.

It is frequently difficult to diftinguifh between a fimple fruit and a compound, or rather aggregate one. M. Richard juftly obferves, that "every fimple fruit muft be the produce of one fimple flower," and that "a fruit of one cell from its earlieft origin, independent of abortion, muft neceffarily be fimple." We can fcarcely, however, affent to his next pofition, "that every fruit originating from a germen with one ftyle ought to be confidered as fimple." This aims at the order of *Contortæ*, in which furely it is offering too great violence to the fenfes, and even to reafon, to fay the two pouches often feparate from the very beginning and totally unconnected when ripe, are one fimple fruit, though the ftyles are incorporated into one. "Every fruit whofe cells are completely, and up to the ftyle, diftinguifhed by true partitions, is fimple." Of this the *Ciftus* may ferve for an example. "Every flower with feveral piftils diftinct throughout, muft be allowed to have a natural plurality of fruits, though all but one piftil may prove abortive." Of this *Caltha* and its allies are examples; and even *Delphinium*, though fome of its fpecies cannot, even in their earlieft ftate, be found to have more than one piftil or germen. "Every fruit which, forming one fimple mafs, prefents on its furface feveral fcattered and diftinct fcars, each of which originally bore a ftigma, is an affemblage of fuch a number of fruits confolidated into one." This is the nature of the *Anona*, and others.

As all true botanifts have confidered the fructification of plants as affording the only certain characters for their fcientific diftribution, fo the moft correct of thefe are generally impreffed with a conviction of the fuperior importance of the fruit in comparifon with the flower. The fyftems of Cæfalpinus, Ray, and their numerous followers, are founded on the fruit, and are infinitely preferable to thofe of Rivinus and Tournefort, eftablifhed on the flower. Amongft more modern writers Gærtner is pre-eminent for his attention to this part, and for his elaborate illuftrations of it in about a thoufand genera. Still, as every philofopher has a bias in favour of the leading object of his purfuit, the author laft mentioned is juftly thought to have fometimes laid too much ftrefs upon the fruit in eftablifhing new genera, without an enlarged and philofophical contemplation of the whole parts of fructification, thus running counter to the excellent Linnæan law, that the "genus ought to give the character, not character the genus." We are, on the other hand, ready to admit that Linnæus, for want of an acquaintance with, or a fufficient attention to, the fruit of feveral plants, has not unfrequently united what ought to be efteemed feparate genera. See Genus, Pericarpium, Capsule, Follicle, Drupa, &c.

As to the ufe of fruit, befides the pleafure and advantage they afford men, &c. they are of fervice in guarding, preferving, and feeding the feed inclofed; in filtrating the coarfer, more earthy, and ftony parts of the nutritious juice of the plant, and retaining them to themfelves; and fending none to the feed but the pureft, moft elaborated, and fpirituous parts, for the fupport and growth of the tender, delicate embryo, or plantule, contained therein.

So that the fruit does the fame office to the feed, that the leaves of the flower do to the fruit.

The ufe of fruits with us might, under proper regulations, be rendered much more extenfive than it is. Many fruits which do hurt when eaten raw, would make wines equal in flavour to many of thofe now obtained at great prices from abroad; and lands which will not bear corn yet would bear

trees

trees and ſhrubs producing ſuch fruits; and the conſequence of this method of culture would be, that much ground, at preſent lying waſte, would be occupied, and great employment found for the numerous poor of ſome of our counties, where the quantities of waſte land are proportionably ſo great, that there is not employment for the people of one half of the county. Cherries properly managed make an excellent wine, and that in very large quantities; and plums alſo make a very agreeable kind, but that it has an auſtereneſs, which muſt be taken off by mixing a little ſugar with it when in the glaſs, not before it is drawn off

A coarſe plum, ſomewhat larger than a damſon, is the beſt kind for this wine. There is a ſort of plum that grows wild in ſome of our hedges. It will ſucceed on any ground, the pooreſt that can be imagined, and it produces a great abundance of fruit. The wine that is made from it is of a very conſiderable ſtrength, and affords a pleaſant brandy by diſtillation in conſiderable quantities. Our common garden currants afford a very agreeable wine; and our gooſeberries are not ſecond to any thing. All theſe produce fruit in great abundance; and the planting and taking care of them is very cheap, and the operation very eaſy. The common way of making theſe wines yields very good ones; but when the art of the experienced Vigneron is employed in it, the liquors will prove much better. Phil. Tranſ. Nº 124.

Fruits are diſtinguiſhed by gardeners into ſtone-fruit and kernel-fruit; ſummer-fruit and winter-fruit; wall-fruit and dwarf-fruit, &c.

M. Quintinie obſerves, that cold, heavy moiſt lands, produce the faireſt and largeſt fruit; but the hotter, drier, and lighter, the more delicious and rich-taſted.

FRUIT *Stalk*. See PEDUNCULUS.

FRUIT, in *Gardening*, the produce of various ſorts of trees uſed as food, either in a raw or prepared ſtate by fire.

All ſorts of fruit ſhould be gathered from the trees or plants when perfectly dry, and never when in a dewy or wet condition. In many of the finer and more delicate fruits, it is of advantage not to permit them to remain on the trees till they are over-ripened. In gathering them, the bloom ſhould always be preſerved upon them as much as poſſible. In the almond, peach, and plum, and finer cherry kinds, it is uſual to depoſit them, as ſoon as gathered, in ſhallow ſieves or baſkets, ſpread over with leaves, or ſome other ſimilar material.

In the gathering of apples and pears, (as thoſe which are ſhaken or beaten from the trees never keep well,) Mr. Forſyth adviſes that they ſhould be all hand-picked, by means of a ſtage or ſteps contrived for the purpoſe, and other apparatus neceſſary for receiving and conveying them away; ſome dried ſhort cut graſs being employed to prevent their being bruiſed on being depoſited in them.

It is likewiſe further obſerved, that great attention ſhould be paid to their ripening, never gathering them at any particular period or ſeaſon, as is often the caſe, on account of their becoming ripe at different times according to circumſtances, but to be regulated by the ſound fruit, where the trees are healthy, coming off into the hand without any force, on being taken hold of; it ſhould be picked off the trees and laid in the baſkets and other places in a careful manner, ſo as to prevent burſting. When it is ſuffered to remain till it begins to fall itſelf, ſome well-dried ſhort graſs mowings, peaſe-haum, barley-ſtraw, or other ſimilar dry material, is recommended to be ſpread over the ſurface of the ground, to prevent the fruit being bruiſed by falling. But the fruit collected in this way ſhould conſtantly be laid up ſeparately, and made uſe of before that which was gathered by the hand; all ſuch as are bruiſed being laid aſide for immediate uſe in the family.

After all the fruit has been gathered, the hay or ſtraw ſhould be raked up and removed from the place.

When the fruit is wholly collected, it muſt be depoſited in the ſtore or fruit-room, ſome of the dried ſhort graſs being previouſly ſpread over the middle part of the floor. It ſhould be carefully laid in heaps from the baſkets upon the dried graſs, each ſort ſeparate; the heaps being from two to three feet in height, according to the quantity of fruit. When the heaps have been formed, they ſhould be covered with the ſame material as was laid on the floor, to the thickneſs of two inches or more, in order that they may ſweat. When they have remained in this ſtate a fortnight, they ſhould be opened and turned over, wiping each with a woollen cloth often dried, carefully removing thoſe that were at the tops to the middle. After having continued eight or ten days more covered as before, the watery material will be ſufficiently expended, when the fruit muſt be again looked over and wiped as in the former caſe, rejecting all ſuch as are in the leaſt degree injured by being bruiſed or otherwiſe.

While the proceſs of ſweating is going on, the windows of the room ſhould be kept open, when the weather is not moiſt, to promote the exhalation of moiſture. When the ſweating is very conſiderable, it will be neceſſary to turn and wipe the fruit during the time the proceſs is going on.

Wheat ſtraw has been commonly made uſe of in laying up this ſort of fruit; but Mr. Forſyth has found, that when any of the fruit begins to decay, if it be not quickly removed, the ſtraw imbibes the moiſture iſſuing from it, and communicates an unpleaſant taſte to ſuch as is found and unaffected.

When fruit is ſtored upon ſhelves in the rooms, it is recommended to have the bottoms covered with thin coarſe canvas, at about eight-pence or ten-pence the yard, and to place them upon it in ſingle layers, after being wiped quite dry, care being taken not to lay them upon each other. They ſhould then be covered with a piece of the ſame canvas, old news, or whited brown paper, to exclude the action of the air, guard againſt froſt, and preſerve the ſmoothneſs on the ſkin of the fruit. It ſhould be turned two or three times in the courſe of the winter, to guard againſt rotting on the under ſide, all the damaged fruit being carefully removed each time.

In ſtoring it in this manner, the earlieſt ſorts ſhould be placed on the lower ſhelves or drawers according as they come in, in this order; the non-ſuch, golden-rennet, and jenneting apples, and the burgamot and burro pears; as the jargonelle is found to keep beſt on the tree, rotting almoſt immediately on being gathered. In this way a proper ſucceſſion of fruit may be provided.

As it requires much time in ſtoring in this way where there is much fruit, it may be done in wet weather, and the evenings, when the men can be better ſpared than in the day-time.

Where there are not proper fruit-rooms, this ſort of fruit may be kept in ſtore-houſes in baſkets or hampers, placing ſoft paper in the bottoms and round the edges to prevent bruiſing them, laying a layer of fruit and a layer of paper alternately, covering the top with paper three or four times folded, to guard againſt the air and froſt, which are liable to injure them.

All the different ſorts of fruit ſhould be packed ſeparately, and have labels faſtened to them, ſo as to know their names, and the times of their being in a proper ſtate for uſe in the family.

But the beſt way of keeping fruit is, however, Mr. Forſyth thinks, by packing it up in glazed earthen pans or jars. In doing which, the fruit ſhould be firſt ſeparately wrapped in ſoft paper, then a little well-dried bran applied over the bottoms of the jars, above which a layer of fruit ſhould be placed, continuing them alternately, till the jars are quite full, when they ſhould be ſhaken, and a little more bran added, covering the whole over with bladders to exclude the air, putting on the covers, which ſhould fit in a cloſe manner. The rooms in which theſe are placed ſhould be capable of admitting a fire in moiſt weather, in order to dry up the dampneſs.

In the buſineſs of packing fruit for carrying, Mr. Forſyth thinks ſtrong deal boxes of different ſizes the moſt convenient and uſeful. Thoſe which he employs are two feet long, having the breadth and depth of fourteen inches; and one foot nine inches long, with one foot in breadth and depth. They are conſtructed of inch-deal, well ſecured by cramps at the corners, having a ſmall iron handle at each end to ſecure them by. In theſe, melons, currants, cherries, pears, peaches, nectarines, plums, grapes, and other ſimilar ſorts of fruit may be carried; the heavieſt fruit of each ſort being put at the bottom, the firſt ſort wrapped up in ſoft paper, and all the others, except the currants and cherries, firſt in vine-leaves, and then ſoft paper. The other two may be conveyed in flat tin boxes, about fourteen inches in length, ten in breadth, and four in depth, with perfect ſafety.

In packing them, for the melons, a layer of fine moſs and ſhort, ſoft, dry graſs, well blended together, is placed at the bottom of the deal box, and then the melons packed in with it in a light manner, in every direction, chooſing them as much of the ſame ſize as poſſible; when the melons are put in, a thin layer of moſs and graſs is placed over them, upon which the tin box, having the currants and cherries packed in it by intervening layers of fine dry moſs, ſo as to be quite full, is packed firmly in with graſs and moſs all round, to prevent its moving; over which another thin layer of moſs is ſpread, and the pears, packed in cloſely in the ſame manner as the melons, proceeding in the ſame way with the other fruits, ſo as to cloſe with the grapes, filling up with moſs, ſo as that the lid of the box may ſhut down quite tight, and prevent rubbing. Each box ſhould be provided alſo with a lock and two keys, to ſerve the whole, one for the packer, and another for the emptier. When the boxes are locked down they ſhould be well corded and kept ſteady.

Fruit *Garden*, that ſort of garden which is principally planted with trees, for the purpoſe of affording fruit of different kinds. The ſituation of this ſort of garden ſhould be warm, ſheltered, and open to the ſouth, or ſouth-weſt, in order that it may enjoy the benefit of the ſun, and of courſe ripen the fruit in the beſt and moſt perfect manner. See Garden and Orchard.

Fruit *Room*, an erection conſtructed for the purpoſe of ſtoring up different ſorts of fruit. Theſe rooms are formed of different dimenſions according to circumſtances, being lined with thin boards, and fitted up with ſhelves, bins, boxes, drawers and other conveniences for the reception of fruit; all of which, as well as the floors, ſhould be of white deal, as Mr. Forſyth remarks, that when red deal is made uſe of for theſe purpoſes, it is liable to give a diſagreeable reſinous taſte to the fruit, and ſpoils its flavour on this account; under other circumſtances he adviſes covering the ſhelves with canvas, &c. as mentioned in the preceding article Fruit.

Fruit *Tree*, is that ſort of tree which produces eatable fruit, either for the table, or culinary uſes, or both.

There are many fruit-trees, fruit-bearing ſhrubs, and ſhrubby plants that ripen their fruit perfectly in this climate, with their ſeveral ſpecies and numerous varieties; the principal ſorts of which are thoſe of the almond kind, as the almond, peach, and nectarine trees; the plum ſort, containing different kinds of plums, apricot, and cherry trees; the pear kind, comprehending various ſorts of pears, apples, and quince trees; the vine, containing many ſorts of grape trees; the fig, comprehending many ſorts of fig trees, the ſeveral ſorts of medlar trees, the different kinds of mulberry trees, the cheſnut, and walnut trees; the common nut kind, containing many ſorts of filberts, and other nut trees; the currant, gooſeberry, and raſpberry trees, with many others; the nature and management of each of which will be fully explained under their reſpective genera and heads.

All ſorts of fruit trees require conſiderable attention in ingrafting, planting, tranſplanting, training, pruning, thinning, and other ſorts of management. See Grafting, Training, Pruning, &c. See alſo Orchard-garden, Orchard, and Nursery.

Fruit and Trees, *ſtealing of*. By ſtat. 4 Geo. II. c. 32. to ſteal, damage, or deſtroy underwood or hedges, or the like, to rob orchards, or gardens of fruit growing therein, to ſteal, or otherwiſe deſtroy any turnips, potatoes, cabbages, parſnips, peaſe, or carrots, or the root of madder, when growing, are puniſhable criminally, (by ſtats. 43 Eliz. c. 7. 15 Car. II. c. 2. 31 Geo. II. c. 35. 6 Geo. III. c. 48. 9 Geo. III. c. 41. 13 Geo. III. c. 32.) by whipping, ſmall fines, impriſonment, and ſatisfaction to the party wronged, according to the nature of the offence. Moreover, the ſtealing by night of any trees, or any roots, ſhrubs or plants to the value of 5*l.* is, by ſtatute 6 Geo. III. c. 36, made felony in the principals, aiders, and abettors, and in the purchaſers thereof, knowing the ſame to be ſtolen. And by ſtats. 6 Geo. III. c. 48. and 13 Geo. III. c. 33. the ſtealing of any timber-trees, therein ſpecified (*viz.* oak, beech, cheſnut, walnut, aſh, elm, cedar, fir, aſp, lime, ſycamore, birch, poplar, elder, larch, maple, and hornbeam), and of any root, ſhrub, or plant, by day or night, is liable to pecuniary penalties, for the two firſt offences, and for the third, is conſtituted a felony, liable to tranſportation for ſeven years. See Larceny.

Fruits, *Summer*, *Fructus horæi*, in the *Materia Medica*, comprehend ſtrawberries, cherries, currants, mulberries, raſpberries, and ſuch like. They poſſeſs a ſweet, ſubacid taſte, and are exhibited as dietetic auxiliaries, as refrigerants, antiſeptics, attenuants, and aperients. They were formerly adminiſtered medicinally in the cure of putrid affections, and to promote the alvine and urinary excretions. As an article of diet, they afford little nouriſhment, and are apt to produce flatulencies. To perſons of a bilious conſtitution and rigid fibres, and whoſe habit is naturally, or from extrinſic cauſes, diſpoſed to an inflammatory or putreſcent ſtate, the moderate and even plentiful uſe of them is ſalubrious; but perſons of a cold, inactive diſpoſition, with lax veſſels, languid circulation, and weak digeſtion, ſhould uſe them ſparingly. The juices extracted from theſe fruits by expreſſion, contain their active qualities freed from their groſſer, indigeſtible matter. On ſtanding, the juice ferments, and changes to a vinous or acetous taſte. By the proper addition of ſugar, and by boiling, their fermentative power is ſuppreſſed, and their medicinal qualities preſerved. The juices of theſe fruits, purified from their feculencies by ſettling and ſtraining, may be made into ſyrups, with a due proportion of ſugar in the uſual way.

Fruit, in *Natural Hiſtory*, denotes the laſt production of a tree,

a tree, or plant, for the propagation or multiplication of its kind; in which fenfe fruit includes all kinds of feeds, with their furniture, &c.

Fruits, *petrified*, (*Carpolithi*) are a numerous family of the organic remains or relics of a former ftate of the globe; according to early writers, who have defcribed a great number of different fruits, found in a petrified ftate in the earth; many of thefe are enumerated by Mr. Parkinfon, (Organic Remains, letter 48, vol. i.) and fhewn to be mere miftakes, as all of them undoubtedly are. The enumeration of thefe kinds of bodies, which we propofe to give under their moft common or vernacular names, will point out thefe miftakes, and refer the foffils to their proper clafs, when it can be done; with particular reference to the authors who have defcribed them, which will, we truft, contribute much to diffipate the cloud of error which ftill, and for a long time, without fuch an expofition, muft continue to hang on the minds of thofe unacquainted with the laborious details of natural hiftory, refpecting the real nature of the reliquia found entombed in the earth, which knowledge now appears to have an important ufe and application, in identifying the ftrata, and trying the validity of the different geological fyftems which have been framed to account for the many aftonifhing appearances which the earth prefents.

Fruits, *Colours from.* The red juices of fruits, as of currants, mulberries, elder-berries, morello, and black cherries, when infpiffated and dried, may be again diffolved in water, to which they give nearly the fame red colour as they do when frefh. Rectified fpirit extracts the tinging particles, and acquires a brighter colour than the watery folution; becaufe much of the mucilage is left undiffolved by the former. The red folutions, and the juices, are fometimes made dull, and fometimes more florid, by acids, and are generally rendered purplifh by alkalies. The colours of thefe juices are generally perifhable. They refift the power of fermentation, but quickly decay, when the jucies are fpread thinly on any fubftance, and dried in open air. The bright lively reds are fooneft changed; the dark, dull, red ftain of the black cherry is confiderably durable. The bright red fruit of the opuntia, or prickly pear, is an exception to the above rule; as it gives, according to Labat, a beautiful red dye. The ripe berries of buckthorn ftain paper of a green colour; from thefe is prepared the fubftance called fap-green; which is a pigment fufficiently durable, foluble in water, but not mifcible with oil. The berries, when green, yield a yellow, and, when over-ripe, a purple pigment. Woollen cloth, prepared with alum and tartar, receives, on being boiled with the berries, a perifhable yellow dye. Neumann's Chem. with Dr. Lewis's Notes, p. 433. See Avignon *Berry*, Annotto, or Roucou, and Turnesol.

Fruits, *Prefervation of.* See Fruit, in *Gardening*, *Prefervation of* Flowers, and *Prefervation of* Vegetables.

For the early ripening of fruits, fee Forcing and Ripening.

Fruit, *Bread.* See Bread.

Fruits, with regard to commerce, are diftinguifhed into *recent*, or *frefh*, and *dry*.

Fruits, *recent*, are thofe fold juft as they are gathered from the tree, without any further preparation; as are moft of the productions of our gardens and orchards, fold by the fruiterers.

Fruits, *dry*, are thofe dried in the fun, or by the fire, with other ingredients fometimes added to them to make them keep; imported chiefly from beyond fea, and fold by the grocers.

Such are raifins, currants, figs, capers, olives, cloves, nutmegs, pepper, and other fpices; which fee under their refpective articles.

Under the denomination of dry fruits are alfo frequently included apples, pears, almonds, filberts, &c.

Fruits, *polypyreneous.* See Polypyreneous.

Fruits *current for Coins.* See Coin.

Fruits, *Firft.* See First *fruits*, Annates, and Primitiæ.

Fruit-*flies*, a name given by gardeners, and others, to a fort of fmall black flies, found in vaft numbers among fruit-trees, in the fpring feafon, and fuppofed to do great injury to them.

Thefe are a fpecies of fmall black fly. Mr. Leewenhoek preferved fome of them for his microfcopical obfervations. He found that they did not live longer than a day or two, but that the females in this time ufually laid a great number of longifh eggs. The gardeners, who fuppofe that thefe flies wound the leaves of the trees, are miftaken; it is true that they feed on their juices, but they have no weapons with which to extract this themfelves; they feed on fuch as is naturally extravafated, and when there is not enough of this for their purpofe, they haunt thofe places where the pucerons refort, and feed on the juices which thefe little creatures extravafate by means of the holes they bore in the leaves with their trunks. Thefe pucerons are a fmall fort of infect very common in our fruit-trees, and other plants and trees; they are of a greenifh colour, and are commonly called tree-lice. Phil. Tranf. No. 262.

Fruit-*ftones.* The mifchiefs arifing from the bad cuftom of many people fwallowing the ftones of plums and other fruit are very great. The Philofophical Tranfactions give us an account of a woman who fuffered violent pains in her bowels for thirty years, returning once in a month, or lefs. At length a ftrong purge being given her, the occafion of all thefe complaints was driven down from her bowels to her anus, where it gave a fenfation of ftoppage and diftenfion, and produced a continual defire of going to ftool, but without voiding any thing. On the affiftance of a careful hand in this cafe there was taken out with a forceps an oblong ball of an oval figure, of about ten drams weight, and meafuring five inches in circumference: this had caufed all the violent fits of pain fhe had been fo many years afflicted with, and after the taking it out fhe became perfectly well. The ball extracted looked like a ftone, and felt very hard, but it fwam in water; on cutting it through with a knife there was found in the centre of it a plum-ftone, round which feveral coats of this tough and hard matter, refembling a ftone, had gathered. Another inftance given in the fame papers is of a man, who dying of an incurable colic, which had tormented him many years, and baffled the effects of medicines, was opened after death; and in his bowels was found the caufe of his diftemper, which was a ball of the like nature with that juft mentioned, but fomething larger, being fix inches in circumference when meafured, and weighing an ounce and a half; in the centre of this, as of the other, there was found the ftone of a common plum, and the cuts were of the fame matter with thofe of the former. Thefe, and feveral other inftances mentioned in the fame place, fufficiently fhew the folly of that common opinion, that the ftones of fruits are wholefome.

For

For though by nature the guts are so defended by their proper mucus, that people very seldom suffer by things of this kind, yet if we consider the various circumvolutions of the guts, their valves and cells, and at the same time consider the hair of the skins of animals we feed on, the wool or down on herbs and fruits, and the fibres, vessels, and nerves of plants, which are not altered by the stomach, it will appear a wonder that instances of this sort of mischief are not much more frequent. Cherry stones, swallowed in great quantities, have occasioned the death of many people, and there have been instances even of the seeds of strawberries, and kernels of nuts, collected into a lump in the guts, and causing violent disorders, which could never be cured till they were carried off. Phil. Trans. No. 282. p. 1282.

FRUITERY, a place for the laying up and keeping of fruit. See GRANARY.

The fruitery should be inaccessible to any thing of moisture, or even frost.

FRUITFULNESS, the quality of bearing plenty of fruit, called also *fertility*, or *fecundity*.

FRUMENTACEOUS PLANTS are those which produce geniculated or knotted stalks, with reed-like leaves; and whose seed growing in spikes or jubæ, is useful to make pultege, or bread.

The word is formed from *frumentum*, a general name comprehending all sorts of corn, or grain, for bread. Hence the Italians, who follow the Latins, use *grano* and *frumento* for the same.

Wheat, barley, rye, millet, &c. are frumentaceous plants. Some authors use frumentaceous in a narrower sense, restraining it to plants which bear a conformity to wheat, either in respect of their fruits, leaves, ears, or the like.

But this seems founded on a mistaken notion of *frumentum*, as if it denoted only *wheat*, which is rather the sense of the word *triticum*.

FRUMENTARII, in *Antiquity*, a kind of soldiers or archers, under the Western empire.

St. Cyprian relates, in one of his letters, that some of these frumentarii were sent to take him.

The first time we read of frumentarii, as officers, is in the time of the emperor Adrian. Spartian, in his life of that prince, assures us, that he made use of them to inform himself of what passed.

Before this time, the name frumentarius was only given to the corn-merchants, or measurers of corn.

These frumentarii did not make any particular corps, distinct from the other forces, but there was a certain number of them in each legion, as, among us, there is a certain number of grenadiers in each battalion. Accordingly, in ancient inscriptions, we meet with frumentarii of this or that legion. It is supposed they were originally a number of young persons, disposed by Augustus throughout the provinces, particularly on all the grand roads to advertise the emperor, with all expedition, of every thing that happened.

In order to this they had a kind of intendance of all the carriages, and on this account came to be employed for the conveyance of corn, *frumentum*, to the armies; whence their appellaticn

Afterwards they were incorporated into the troops themselves, where they still retained their ancient name.

Their principal office was the giving intelligence, in which they agreed with those called *curiosi*, with whom they were frequently joined. See CURIOSUS.

The function of these soldiers at first was to distribute to their comrades the measures of corn allotted to each man; and as their ministry gave them an opportunity of knowing all the soldiers of a cohort, or a legion, they were directed to examine into their characters, and give an account of such as they should believe to be seditious, and capable of raising disturbance. Their commission was afterwards enlarged, and they were authorised to observe, not only in the legion, but in the cities and provinces, every commotion, every suspicion of revolt, and to give notice of it to the court. Thence arose perpetual informations, and frequent calumnies against innocent people, many of whom perished upon false accusations of treason, always too readily listened to by princes. These public spies were suppressed by Diocletian, for which popular act he was universally applauded. However, either he or his successors established in their room agents or officers, who soon became equally formidable and pernicious.

FRUMENTATION, FRUMENTATIO, among the *Romans*, a largess of corn bestowed on the people. This practice, of giving corn to the people, was a very ancient custom among the Romans, and frequently used to soothe the turbulent humour of the populace.

At first the number of those to whom this largess was given, was indeterminate, till Augustus fixed it at two hundred thousand.

FRUMENTIUS, in *Biography*, a saint in the Roman calendar, entitled the "Apostle of Ethiopia," was a native of Tyre, and flourished in the fourth century. He was educated under Meropius, a christian philosopher, who embarked in a voyage to India, and was accompanied by Frumentius and another scholar named Ædæsius, but having the misfortune to touch on the coast of Ethiopia, Meropius was inhumanly murdered by the natives, and his scholars sent up the country to be slaves to the emperor. This prince conferred upon them posts of honour about his person, and in his houshold; shewed them marks of his favour, and a little before his death gave them their liberty. They now proposed to return to their native country, but at the earnest solicitations of the queen, they consented to remain some time longer to superintend the education of the young prince. In this confidential situation they were enabled to perform many kind actions; and among others they obtained liberty for the Roman merchants residing in the ports of Ethiopia, who were christians, to assemble together for the worship of God, and they succeeded in making many converts, among the courtiers, to christianity. As soon as their pupil had taken on himself the management of the government, they, after much difficulty, were allowed to return home. Frumentius repaired to Alexandria, acquainted Athanasius, who was bishop of that city, with the progress that had been made in introducing Christianity into Ethiopia, and pointed out to him what prospects there were of farther success. Frumentius, at the solicitation of Athanasius, was soon after consecrated a bishop, and appointed on a mission to Ethiopia. This was in the year 331: he entered upon his labours at Axuma, the capital of the country, and was so successful, that in a short time the emperor, and a great body of his people, were converted to the christian faith, and numerous churches were established throughout the empire. Moreri.

FRUMENTUM SARACENICUM, in *Botany*, a name by which some authors express the fagopyrum, or buck-wheat. See POLYGONUM.

FRUMENTUM *Indicum*, *Indian corn*, a name given by our American planters to *Maize*, which see.

FRUMENTY, popularly *Furmety*, a kind of pottage, the basis whereof is wheat, boiled up with milk, sugar, and sometimes spice.

Pliny tells us, that in his time they mixed chalk among it.

Galen deſcribes it as a very nutritious food made of corn, or pulſe, boiled with water, wine, and oil.

The Latins called it *alica*, which Feſtus derives *ab alendo*, as being very nouriſhing. But then it muſt be obſerved, they made it of any kind of corn.

Ours being reſtrained to wheat, we have given its denomination accordingly, from *frumentum*. An emulſion, wherein wheat was an ingredient, would be a kind of frumenty.

FRUMGYLD, in our *Old Writers*, is the firſt payment made to the kindred of a perſon ſlain, towards the recompence of his murder. L.L. Edmund.

FRUMO, in *Geography*, a ſmall iſland on the weſt ſide of the gulf of Bothnia. N. lat. 65° 23′. E. long. 21° 37′.

FRUMSTOL, in our *Old Writers*, the chief ſeat or manſion-houſe, which is called by ſome the *homeſtal*. Leg. Inæ, cap. 38.

FRUNDELE, in *Agriculture*, the name of a dry meaſure, which conſiſts of two pecks, or half a buſhel. It is only uſed in particular diſtricts.

FRUR, or Nobfleur, or *Tavem*, in *Geography*, a ſmall iſland in the Perſian gulf. N. lat. 26° 10′. E. long. 54° 20′.

FRUSH, or Frog, in the *Manege*, is a ſort of tender horn which ariſes in the middle of the ſole, and at ſome diſtance from the toe of a horſe; it divides into two branches, running towards the heel, in form of a fork.

FRUSINUM, in *Ancient Geography*, a town of Italy, in the country of the Volſci, on the confines of that of the Hernici, at the 54th mile from Rome on the Latin way; 7 miles from Ferentinum, and 14 from Fregellanum, near the ſmall river Coſa. In the year of Rome 450 it was taken by the Romans; but in proceſs of time, they rebuilt its walls, planted in it a colony, and diſtributed the adjacent land among the victors. It is now *Fraſinone*, in the Campagna; 25 miles E. of Veletri. N. lat. 41° 40′. E. long. 13° 13′.

FRUSSURA, in our *Old Writers*, a breaking down; alſo a ploughing or breaking up. *Fruſſura domorum* is houſe-breaking; and *fruſſura terræ*, new broken land.

The word comes from the French, *froiſſure*, a bruiſe; and that from the verb *froiſſer*, to bruiſe or break.

FRUSTUM, in *Mathematics*, a piece cut off or ſeparated from a body.

Frustum of a pyramid, or cone, is that part which remains when any part next the vertex, cut off by a plane parallel to the baſe, is taken away.

The fruſtum A B C D E F A (*Plate* VII. *Geometry*, *fig.* 88.) of any pyramid having a triangular baſe, is equal to a whole pyramid, of the ſame baſe and altitude, together with two other pyramids that are in proportion to it; the one, as any ſide B D of the upper baſe B C D, is to its correſpondent A E of the ſame baſe A F E, and the other, as the ſquare of the former ſide is to the ſquare of the latter.

In the planes of the three ſides, draw the diagonals B E, B F, and F D; then will the part B C D of the fruſtum, cut off by a plane extended by F B and F D, be a pyramid on the baſe B C D, having the ſame altitude with the fruſtum itſelf, both ſolids being contained between the ſame parallel planes A F E, B C D. Moreover, the remaining part F A B D E of the fruſtum, if a plane be extended by F B and F E, will be divided into the two pyramids F B D E, F A B E, having the ſame ratio, one to the other, as their baſes B E D, A B E, or as B D to A E. But the latter of theſe pyramids B A F E, taking B as its vertex, has the ſame baſe and altitude with the fruſtum given; and the pyramid F B C D is in proportion to it as the baſe B C D to the baſe A F E, that is, the baſes being ſimilar, as BD^2 to AE^2.

Hence it follows, that ſince of the three ſolids, F A B E, F B D E, F B C D, into which the fruſtum is divided, the ratio of the firſt and third is the duplicate of that of A E to B D, or of the ratio of the firſt to the ſecond, theſe three ſolids are proportional. Whence it appears, that the fruſtum of any triangular pyramid is equal to two whole pyramids of the ſame altitude on baſes, equal to the two oppoſite baſes of the fruſtum, and to a third pyramid, which is a mean proportional between the two former. And beſides, whatever is demonſtrated in relation to triangular pyramids, muſt hold equally in all pyramids and cones; becauſe every ſuch ſolid is equal to a triangular pyramid of equal baſe and altitude; and every fruſtum of the one is alſo equal to the correſponding fruſtum of the other. See Pyramid.

From the propoſition above demonſtrated we may deduce a method of finding the content of any fruſtums of pyramids and cones. Firſt, Let the fruſtum M N be that of a pyramid; then, having found the content of a whole pyramid, of the ſame given baſe and altitude (ſee Pyramid); ſay, as any ſide A of the lower end or baſe is to its correſpondent B of the upper, ſo is the ſaid content to a fourth proportional; and as A is (again) to B, ſo is the quantity laſt found to another proportional; which two proportionals, added to the content firſt determined, will give the true content of the fruſtum. That theſe quantities anſwer to the conditions of the propoſition will appear from the following ſtatement, P being the whole pyramid; thus, $A : B :: P : D$ and $A^2 : B^2 :: P : C$, which is equal to a fourth proportional to A, B, and D; for, in the one caſe, $C = \frac{B^2 \times P}{A^2}$, and in the other, $C = \frac{D \times B}{A}$, becauſe $D = \frac{BP}{A}$; and therefore $C = \frac{B^2 \times P}{A^2}$.

When the oppoſite baſes of the fruſtum are ſquares, the rule will be more ſimple, and put on a better form: for then the area of the baſe being A^2, the content of a whole pyramid on that baſe, of the ſame altitude with the fruſtum, will be equal to the parallelepipedon $C \times A^2$; C being ⅓d of the given altitude of the fruſtum. But $A : B :: C \times A^2 : C \times A \times B$ (ſee Parallelepipedon); and $A : B :: C \times A \times B : C \times B^2$; therefore, $C \times A^2 + C \times A \times B + C \times B^2 = C \times \overline{A^2 + A \times B + B^2}$, the content required. Hence we obtain the following rule for finding the content of the fruſtum of any ſquare pyramid: Add the product of the two ſides of the lower and upper ends to the ſum of their ſquares, and then multiply the aggregate by ⅓d of the pyramid's height. Secondly, from the content now found, that of any conical fruſtum P Q (*fig.* 90) is readily obtained; being in proportion to the content $C \times \overline{A^2 + A \times B + B^2}$ of the fruſtum of a ſquare pyramid circumſcribing it, as the baſe of the former is to the baſe of the latter; or, as the fraction ,7854 is to unity; this being the proportion of the area of the circular baſe to the ſquare on the diameter: thus, $PQ : C \times \overline{A^2 + AB + B^2} :: ,7854 : 1$; therefore $PQ = ,7854 \times C \times \overline{A^2 + AB + B^2}$ = (calling the altitude a) $,7854 \times \frac{1}{3} a \times \overline{A^2 + AB + B^2} = ,2618 \times a \times \overline{A^2 + AB + B^2}$ or $= E \times \overline{A^2 + AB + B^2}$, by taking $E = ,7854 \times C$ = the ,2618th part of the whole given altitude. Hence, for finding the content of any fruſtum of a cone, we have the following rule: Add the product of the diameters of the two ends to the ſum of their ſquares; then multiply the aggregate by the fruſtum's height, and the product, again, by the fraction ,2618.

Thirdly.

Thirdly. For finding the content of any ſegment I A K (*fig.* 91.) of a ſphere, a rule may be deduced in the following manner. It appears from the property of the ſphere (ſee Sphere,) that the ſegment propoſed, I A K, is equal to the difference between a conical fruſtum F C D H, and a cylinder E C D G of the ſame altitude, ſtanding upon a baſe, whoſe radius C A is equal to that A O of the ſphere itſelf; the cone being ⅓d of a cylinder of the ſame baſe and altitude; and the difference of the cone and cylinder being ⅔ds of the latter or equal to the ſphere, and like parts being as their wholes. But the content of the fruſtum F C D H, if the two diameters C D and F H be repreſented by A and B, and the ,2618th part of the altitude D by E, will be $= E \times \overline{A^2 + A \times B + B^2}$ (that is, equal to a parallelepipedon whoſe altitude is E and baſe $= \overline{A^2 + A \times B + B^2}$.) And the content of the cylinder E C D G will be $= 3 E \times A^2$, or $E \times 3 A^2$; becauſe $3 E = 3 \times ,2618 D = ,7854 \times D$; and the content of the cylinder = the area of the baſe multiplied by its height (ſee Cylinder); but the area of the baſe is, from the property of the circle, $= ,7854 \times A^2$, and the height = D: therefore $3 E \times A^2 = ,7854 \times D \times A^2 =$ the content of the cylinder. Conſequently, the difference, or the content of the ſegment I A K, will be $= E \times 3 A^2 - E \times \overline{A^2 + A B + B^2} = E \times \overline{2 A^2 - A \times B - B^2}$. But $2 A^2 - A \times B - B^2$ is compoſed of $A^2 - A \times B$ and $A^2 - B^2$; the former part of which $A^2 - A \times B$ is $= \overline{A - B} \times A = 2 D \times A$ (becauſe $A - B$, or $C D - F H = E F + H G = 2 A B$ or $2 D$, becauſe the triangle E F C, being equiangular with C O A, is iſoſceles); and the latter part $A^2 - B^2 = \overline{A - B} \times \overline{A + B} = 2 D \times \overline{2 A - 2 D}$; $\overline{A - B}$ being equal $C D - F H = 2 D$, and $\overline{A + B} = \overline{E G + F H} = E G + \overline{E G - 2 D} = 2 A - 2 D$. Whence the ſum of both parts will be $= 2 D \times \overline{3 A - 2 D}$; and the content of the ſegment itſelf $= E \times 2 D \times \overline{3 A - 2 D} = ,2618 D \times 2 D \times \overline{3 A - 2 D} = ,5236 \times D^2 \times \overline{3 A - 2 D}$. Hence we have the following rule for finding the content of any ſegment of a ſphere: Multiply the ſquare of the ſegment's height by the exceſs of thrice the ſphere's diameter above the double of that height; and then multiply by the fraction ,5236. See Segment.

Otherwiſe. To find the ſolidity of the fruſtum of a pyramid; add into one ſum the areas of the two ends and the mean proportional between them, and then multiply the ſaid ſum by the perpendicular height, and ⅓d of the product will be the ſolidity. *E. G.* If A be the area of the greater end, a that of the leſs, and h the height; then $\overline{A + a + \sqrt{A a}} \times \frac{1}{3} h$ will be the ſolidity. Hence, 1. If the ends be regular polygons, the rule will be more eaſy, and it is this, as we have above ſtated it; add together the ſquare of a ſide of each end of a fruſtum, and the products of thoſe ſides; multiply the ſum by the height, and the product by the tabular area anſwering to the particular figure of the ends; and ⅓d of the laſt product will be the content. Or, divide the difference of the cubes of the ſaid ſides by their difference, and multiply the quotient by the height, and the tabular area, and take ⅓d of the product. 2. If the ends be circles, the fruſtum will be that of a cone, and then multiply ,2618, *viz.* ⅓d of ,7854, by the height, and the product either by the quotient ariſing from the diviſion of the difference of the cubes of the diameters by the difference of the diameters, or by the ſum ariſing from the addition of the ſquare of each diameter and the product of the diameters, or by the ſum ariſing from the ſquare of the half difference of the diameters added to triple the ſquare of the half ſum. The principles from which theſe rules are deduced will appear under the article Pyramid.

To find the ſolidity of the ſegment of a ſphere. Rule 1. To three times the ſquare of the radius of its baſe, add the ſquare of its height; multiply the ſum by the height, and the product by ,5236 for the ſolidity. (See *fig.* 92.) Thus, if $r =$ D E the radius of its baſe, and $h =$ G E the height: then $,5236\, h \times \overline{3 r r + h h} =$ the ſolidity of the ſegment D G F. Rule 2. From three times the diameter of the ſphere, ſubtract twice the height of the fruſtum; multiply the difference by the ſquare of the height, and the product by ,5236 for the ſolidity. That is, if $d =$ G H the diameter of the ſphere, and $h =$ G E, the height of the fruſtum; then $,5236\, h^2 \times \overline{3 d - 2 h} =$ the ſolidity of D G F.

To find the ſolidity of a fruſtum or zone of a ſphere. Add together the ſquares of the radii of the ends and ⅓d of the ſquare of their diſtance, or of the height: multiply the ſum by the ſaid height, and the product again by 1,5708 for the content. That is, $\overline{R^2 + r^2 + \frac{1}{3} h^2} \times \frac{1}{2} p h =$ the ſolidity of the fruſtum whoſe height is h, and the radii of its ends R and r, p being 3,1416. For the reaſons of theſe rules, ſee Sphere, or Hutton's Menſuration, p. 206.

To find the content of the fruſtum of a ſpheroid; its ends being perpendicular to one of the axes, and one of them paſſing through the centre. Rule 1. To the area of the leſs end, add twice that of the greater: multiply the ſum by the altitude of the fruſtum; and ⅓d of the product will be the content. That is, $\overline{2 D^2 + d^2} \times \frac{1}{3} a n =$ the fruſtum whoſe ends are perpendicular to the fixed axis; where D is the diameter of the greater end, d that of the leſs, a the altitude, and $n = ,785398$. And $\overline{2 T C + t c} \times \frac{1}{3} a n =$ the fruſtum whoſe ends are parallel to the fixed axis; where T and C are the tranſverſe and conjugate axes of the greater end, and t and c thoſe of the leſſer end. Here it is evident that the double of the fruſtum will give the content of the zone, or ſpheroidal caſk. Rule 2. From three times the ſquare of the ſemi-axis perpendicular to the ends of the fruſtum, ſubtract the ſquare of the height of the fruſtum; then multiply the difference by ⅓d of the height, and the product by 3,14159, &c.; and call the laſt product P: then, 1. If the ends be parallel to the fixed axis, ſay, as the revolving axis is to the fixed axis, ſo will P be to the content of the fruſtum. 2. When the ends are perpendicular to the fixed axis, ſay, as the ſquare of the fixed axis is to the ſquare of the revolving axis, ſo is P to the content of the fruſtum. That is, $\frac{3 ff - h h}{3 ff} \times p h r r$ will be the fruſtum whoſe ends are perpendicular to the fixed axis: and $\frac{3 r r - h h}{3 r} \times p h f$, the fruſtum whoſe ends are parallel to the fixed axis; f being the fixed, and r the revolving ſemi-axis, h the height, and $p = 3,14159$, &c. For the reaſons of theſe rules, ſee Spheroid, and Hutton, ubi ſupra.

We have a general theorem in Mr. Maclaurin's Treatiſe of Fluxions, concerning the fruſtum of a ſphere, cone, ſpheroid, or conoid, terminated by parallel planes, when compared with a cylinder of the ſame altitude, on a baſe equal to the middle ſection of the fruſtum made by a parallel plane. The difference between the fruſtum and the cylinder is always the ſame in different parts of the ſame,

or of fimilar folids, when the inclination of the planes to the axis, and the altitude of the fruftum, are given.

In the parabolic conoid this difference vanifhes, the fruftum being always equal to a cylinder of the fame height, upon the fection of the conoid that bifects the altitude of the fruftum, and is parallel to its bafes.

In a fphere, the fruftum is always lefs than the cylinder by one-fourth part of a right-angled cone, of the fame height with the fruftum, or by one half of a fphere of a diameter equal to that height; and this difference is always the fame in all fpheres, when the altitude of the fruftum is given.

In the cone, the fruftum always exceeds the cylinder by one-fourth part of the content of a fimilar cone that has the fame height with the fruftum.

In the hyperbolic conoid this excefs is the fame as in the cone generated by a triangle $o\,c\,e$, (*fig.* 93) formed by the axis $o\,c$, the afymptote $o\,e$, and a perpendicular $c\,e$, the altitude of the fruftum and the inclination of the axis to their bafes being the fame in both.

In the fpheroid (*fig.* 94.) the cylinder exceeds the fruftum; and the difference between them is the fame as in the cone C D $r\,d$, the plane D $r\,d$, or B $k\,b$, being fuppofed parallel to thofe which terminate the fruftum. In different inclinations of thofe planes, when the altitude of the fruftum is given, that difference is reciprocally as the cube of the diameter B b, which is the conjugate of C A, the axis of the fruftum. But if the altitude of the fruftum be alfo varied fo as to be reciprocally proportional to the diameter B b, then the difference between the fruftum and cylinder will be always of the fame magnitude in the fame fpheroid or conoid.

When the inclination of the axis of the folid to the planes that terminate the fruftum is given, the difference between the fruftum and cylinder, in the fame, or in fimilar bodies, is as the cube of their common altitude. Maclaurin's Fluxions, Introd. p. 24, 25.

The rules above given, and others of the fame kind, are of ufe in the menfuration of timber, and alfo in gauging. We fhall fubjoin a few examples of their application.

1. How many folid feet are there in a tree, whofe bafes are fquares, each fide of the one being 15 inches, and each fide of the other 6, and the length along the fide meafuring 24 feet? (*fig.* 95.)

Here $15 \times 15 = 225$, the greater bafe, and $6 \times 6 = 37$, the lefs, and $15 \times 6 = 90$, their mean. Their fum is 351, and $\frac{1}{3}$d of it is 117. But A B $-$ D E $= 7\frac{1}{2} - 3 = 4\frac{1}{2}$ $=$ A F, and $\sqrt{\mathrm{AD}^2 - \mathrm{AF}^2} = \sqrt{\overline{24 \times 12}|^2 - \overline{4\frac{1}{2}}|^2}$ $= 287{,}9649$ inches $=$ D F, the perpendicular. Confequently, $117 \times 287{,}9649 = 33691{,}8933$ inches $= 19{,}49762$ feet $=$ the folidity.

2. If a cafk, confifting of two equal conic fruftums joined together at the bafes, have its bung-diameter 28 inches, its head-diameter 20 inches, and length 40 inches; how many gallons of wine will it hold?

Here $20^2 \times ,7854 = 314{,}16$ = the area at the end,

And $28^2 \times ,7854 = 615{,}7536$ = the area of the bung circle,

And $20 \times 28 \times ,7854 = 439{,}824$ = their mean proportion.

Their fum is 1369,7376

And its third part is 456,5792

which multiplied by 40, the length of both fruftums together produces 18263,168 folid inches; which divided by 231, the inches in a wine gallon, thus,

$$231 = 3 \times 7 \times 11 \begin{cases} 3)\ 18263{,}168 \\ 7)\ 6087{,}7226 \\ 11)\ 869{,}6746 \end{cases}$$

gives - 79,0613 wine gallons.

Or, $\overline{20^2 + 28^2 + 20 + 28} \times 40 \times 0{,}2618 = 1744 \times 10{,}472 = 18263{,}168$, the folidity as before.

3. What is the folidity of each of the frigid zones of the earth: the axis being $7957\frac{3}{4}$ miles, and half the breadth, or arc D A, (*fig.* 92.) of the zone being $23\frac{1}{2}$ degrees?

By rule 2. As $1 =$ tabular radius : $3978\frac{7}{8} =$ radius of the earth, : : $,0829399 =$ tab. verfed fine of $23\frac{1}{2}$ degrees : 330,0074946, the verfed fine or height of the fegment. Then $,5236\,h^2 \times \overline{3d - 2h} = ,5236 \times 330{,}0074946^2 \times 23213{,}2350108 = 1323679710$, the content.

By rule 1. As $1 : 3978\frac{7}{8}$: : $,3987491 =$ tabular fine of $23\frac{1}{2}$ degrees : 1586,57282526, the radius of the bafe. Then $,5236\,h \times \overline{3r^2 - h^2} = ,5236 \times 330{,}0074946 \times 7660544{,}936 = 1323680299{,}69$, the folidity.

4. What is the folidity of the fruftum of a fphere, the diameter of whofe great end is four feet, the diameter of the lefs three feet, and the height $2\frac{1}{2}$ feet? Here $\overline{\mathrm{R}^2 + r^2 + \frac{1}{3}h^2} \times 1{,}5708\,h = \overline{2^2 + 1{,}5^2 + \frac{1}{3} \times 2{,}5^2} \times 1{,}5708 \times 2\frac{1}{2} = 8\frac{1}{3} \times 3{,}927 = 32{,}725$, the folidity of the fruftum required.

5. What is the folidity of each temperate zone of the earth, extending from $23\frac{1}{2}$ degrees to $66\frac{1}{2}$ degrees of latitude, and the diameter of the earth being $7957\frac{3}{4}$ miles? The radius of the top appears by the third example to be 1586,57282526; and as $1 : 3978\frac{7}{8}$: : $,9170601 =$ tabular fine of $66\frac{1}{2}$ degrees : 3648,86750538, the radius of the bafe. Alfo the height is 2062,2955. Then $\overline{\mathrm{R}^2 + r^2 + \frac{1}{3}h^2} \times 1{,}5708\,h = 17249136 \times 2062{,}2955 \times 1{,}5708 = 55877778668$, the folidity of each temperate zone. Otherwife; fince the radii of the ends of this zone are the fines of $23\frac{1}{2}$ and $66\frac{1}{2}$ degrees, which are complements the one of the other, the fum of the fquares of thefe radii will be equal to the fquare of the radius of the fphere; and therefore $\overline{\frac{1}{4}dd + \frac{1}{3}hh} \times 1{,}5708\,h = 17249136 \times 2062{,}2955 \times 1{,}5708 = 55877778668$, the content as before.

6. There is a cafk in the form of the middle fruftum, or zone, of an oblong fpheroid; the bung-diameter is 30, the head-diameter 18, and the length of the cafk 40 inches; what is the content in ale and wine gallons? Here D $= 30$, $d = 18$, and $a = 40$. Therefore $\overline{2\,\mathrm{D}^2 + d^2} \times \frac{1}{3}\,a\,n = \overline{2 \times 30^2 + 18^2} \times ,2618 \times 40 = 2124 \times 10{,}472 = 22242{,}528$ = the content in inches. Then, fince the ale gallon meafure contains 282 cubic inches, and the wine gallon 231, we have $22242{,}528 \div 231 = 96{,}288$ wine gallons.

7. If the axes of an oblong fpheroid be 50 and 30, required the content of a fruftum whofe ends are perpendicular to the fixed axis, and one of them paffing through the centre, the height of the fruftum being 20 inches. Here $\frac{3ff - hh}{3ff} \times p\,h\,r\,r = \frac{3 \times 25^2 - 20^2}{3 \times 25^2} \times 3{,}14159 \times 20 \times 15^2 = 1475 \times 3{,}14159 \times \frac{12}{5} = 11121{,}23799$ = the content required. For a variety of other examples we refer to Hutton's Menfuration, part iii. § 5. See GAUGING and TIMBER.

FRUTEX. See SHRUB.

FRUTICOSE *Stalks of Plants* are thofe of a hard, woody fubftance.

FRUTIGEN, in *Geography*, a fmall town of Switzerland, in the canton of Berne, terminating a rich valley, parallel to that of Lauterbruennen, and commencing that of Kander, watered by a river of the fame name, and bounded by mount Kander. Frutigen gives name to a bailiwick, that was formerly governed by lords of its own, and efteemed one of the moft beautiful places in Switzerland, eight miles S. of Spietz, and 30 S. E. of Friburgh.

FRY, in *Ichthyology*, fignifies the fpawn, or rather the young of fifh. See FISH.

FRY's *Bay*, in *Geography*, a bay on the S. W. coaft of the ifland of Antigua; two miles S. of Reed point.

FRY, *Cape*, a cape in Hudson's bay. N. lat. 64°. W. long. 88°.

FRYBERG, a town of Bohemia, in the circle of Bechin; nine miles W. of Rofenberg.

FRYBURGH, a poft town of America, pleafantly fituated in York county, Maine, in a bend of Saco river; incorporated in 1777, having a flourifhing academy, and containing 447 inhabitants. This is the ancient village Pigwaket, through which the upper part of Saco meanders; 60 miles from the fea, and 120 N. by E. from Bofton. N. lat. 44° 2'. W. long. 70 47' 30".

FRYDUFFRIN, a townfhip of America, in Chefter county, Pennfylvania.

FRYING-PAN, a dangerous fhoal, fo called from its form, lying at the entrance of Cape Fear river in North Carolina; the S. part of it being in N. lat. 33° 32. W. long. 75°; fix miles from Cape Fear Pitch, and 24 S. E. by S. from the light-houfe on Bald Head.—Alfo, an ifland in Muddy Lake, Upper Canada, to the northward of Pointe de Tour.

FRYKERYD, a town of Sweden, in Warmeland; 10 miles N. W. of Philipftadt.

FRYKSANDE, a town of Sweden, in Warmeland; 35 miles N. W. of Philipftadt.

FRYSOYTA, a town of Germany, in the bifhopric of Munfter; 64 miles N. of Munfter. N. lat. 52° 17'. E. long. 7° 46'.

FRYTH, or FRITH, is explained, by fir Edward Coke, as a plain between two woods, or a lawn.

Camden ufes it for an arm of the fea, or a ftrait between two lands, from *fretum*.

Frith, from the Saxon *frid, peace*, is alfo ufed for a wood; becaufe the Englifh Saxons held woods to be facred, and ufed them as fanctuaries.

FUAGE, or FOCAGE, a tax or impofition laid on hearths or chimneys, *i. e.* on fire-places, or families, from which was probably derived the *hearth-filver*, and *chimney-money*. This duty was repealed by 1 William and Mary, feff. 1. cap. 10.

Edward the black prince, having Aquitain granted him, laid an impofition of fuage, or focage, upon the fubjects of that dukedom, *viz.* one fhilling for every fire-place. After his example, Charles V. of France laid a tax of a franc for each fire-place, for one year only. His fucceffor Charles VI. augmented it under the fame name. Charles VII. rendered it perpetual, and called it *taille*.

By an ordonnance of Humbert II. dauphin of Viennois, the impofition of focage, or feuage, was then laid per feu, *i. e.* per fire, or family, *feu per lares focum habentes*. In Latin it was called *focagium*, q. d. *pro fingulis focis*. Sometimes it was alfo called *fournage*, on account of the oven or furnace: in Greek καπνικον or καπνος, *fumus, fmoke*. In Will. Tyr. De Bello Sacro, it is called *foagium*: for it was impofed by the kings of Jerufalem. The counts and other lords likewife impofed it on the feudatories, or vaffals. Zonaras affures us, that the general Nicephorus firft eftablifhed it among the Greeks. See CHIMNEY-*money*, and FUMAGE.

FUCA, in *Ichthyology*, a name given by Gaza, and fome other writers, to the fifh called phycis by Ariftotle, Ælian, and other writers; and *tinca marina*, by Salvian and Rondeletius. It is in the Linnæan fyftem the BLENNIUS *phycis*. See PHYCIS.

FUCA, *Juan de*, in *Geography*. See JUAN *de Fuca*.

FUCCAGE, a town of Japan, in the ifland of Ximo; 30 miles E. of Nagafaki.

FUCECCHIO, a town of Etruria, on a lake; 22 miles W. of Florence.

FUCHS, or FUCHSIUS, LEONHARD, in *Biography*, a diftinguifhed phyfician and botanift of Germany, particularly celebrated for his figures of plants, was born at Wembding, in Bavaria, in the year 1501. He loft his father when five years old, but his mother, who is reprefented as a woman of very fuperior talents and virtues, took great care of his education, and was rewarded by the fuccefs and celebrity of her fon. After ftudying the claffics at Hailbrun and Erfort, he took his firft degree at the age of 17, with great credit, in the univerfity laft mentioned. In his 19th year he removed to Ingoldftadt, in order to profit by the inftructions of Capnius, and Ceporinus, two profeffors eminent for their fkill in the learned languages, and ftill more for the zeal and honefty by which, in the dawn of the reformation, they made themfelves obnoxious to the monkifh faction, by expofing the corruptions of the church, and promoting a liberal and enlarged fcheme of education. Fuchfius attached himfelf clofely to thefe able and enlightened teachers, and while he made a great progrefs in Greek and Latin literature by means of their inftructions, he imbibed their liberal fpirit and chriftian piety. He received the degree of mafter of arts, Jan. 17, 1521, and having fubfequently applied himfelf with great diligence to the ftudy of medicine, he was made doctor of phyfic in March 1524, being then about 23 years of age. He had in the mean while become a zealous follower of Luther, and an afferter of the authority of the holy fcriptures alone, in oppofition to papal power and corruption. Hence he was doubtlefs one of thofe who gave occafion to the charge, ftill renewed from time to time as circumftances may require, that phyficians are prone to atheifm; by which has generally been meant that they are hoftile to certain impofitions and corruptions, in which they have no intereft, but which cannot be entirely concealed from them in the courfe of a learned education. This charge the excellent fir Thos. Brown and others have thought it worth while, in dark and troubled times, to repel. Happy would it have been had the conduct or character of no phyfician or profeffed philofopher, at a more enlightened period, given frefh ftrength to a calumny that ought to have fallen by its own abfurdity.

Fuchfius fettled firft as a phyfician at Munich, where he foon after married a young lady of good birth and education, named Anna Fridperger, who bore him four fons and fix daughters, and with whom he enjoyed great conjugal felicity till Feb. 1563, when fhe died. He afterwards married a widow, who furvived him. He removed to Ingoldftadt in May 1526, where he became profeffor of medicine, but found himfelf ill at his eafe with refpect to religion. This induced him to accept the invitation of George, Margrave of Bayreuth, to fettle at Onoltzbach, about two years afterwards, where he received a handfome falary from his patron, who treated him with fingular refpect. He was particularly fuccefsful in the practice of medicine, efpecially

in the treatment of the ſweating ſickneſs, which in 1529 began to rage in Germany. In the courſe of his five years' reſidence at Onoltzbach, Fuchſius publiſhed a Compendium or Introduction to the Practice of Phyſic; the ſixth book of Hippocrates on epidemic diſeaſes, tranſlated from the Greek into Latin, with an ample commentary; an Apology againſt Triverius, a phyſician of Louvain, recommending bleeding on the right ſide in inflammations of the viſcera, eſpecially in pleuriſy; three books of Medical Paradoxes, in which many errors of the Arabian and more recent phyſicians are refuted.

At length, the management of the univerſity of Ingoldſtadt was committed, by William duke of Bavaria, to Leonhard Eccius, a celebrated lawyer, who, knowing the merit of Fuchſius, procured his return to his former profeſſorſhip there in 1533. But he had made himſelf too conſpicuous as a proteſtant, and was too little diſpoſed to aſſimilate his opinions, his manners, or his principles of education to thoſe of the ruling powers, to remain at peace; inſomuch that, notwithſtanding the ſteady patronage of Eccius, he returned in Auguſt of the very ſame year to Onoltzbach, taking refuge for a year afterwards at Culmbach, with the family of the margrave, on account of the peſtilence.

At this period Ulric duke of Wirtemberg, having embraced the reformed religion, was very anxious to induce the moſt learned profeſſors of that faith to eſtabliſh themſelves at his univerſity of Tubingen, in order to render that ſchool an aſylum for all ſuch as were diſpoſed to ſhake off and to expoſe the papal uſurpations. Fuchſius was invited among the reſt, and, on ſettling there in 1535, received an ample ſtipend, as well as the moſt diſtinguiſhed favour from the ſovereign and his ſon prince Chriſtopher. Here he continued in great fame and ſucceſs for 35 years. At length, in his 65th year, he was ſeized with an acute diſeaſe attended with great watchfulneſs, which proved fatal on the 10th of May 1566. He died in the arms of his wife and children, full of faith and fortitude, having in the courſe of his illneſs been obſerved to experience no relief from his ſufferings, but while converſing with his friends on the ſubjects of religion and a future ſtate, which made him forget every thing elſe, and he expreſſed himſelf with all his uſual energy and perſpicuity. He was interred, the day after his death, in a burying ground adjoining to the town, where his firſt wife had been depoſited but little more than three years before.

Some botanical remarks of Fuchſius, relating principally to the Arabian writers, are found in the 2d volume of the *Herbarium* of Brunfelſius. But the work on which his reputation in this line of ſtudy chiefly reſts, is his *Hiſtoria Plantarum*, publiſhed at Baſil in 1542. It conſiſts of one volume in folio, with numerous wooden cuts. A German edition appeared the following year. In this work he chiefly copies Dioſcorides, adding a few remarks of his own, and falling, as Haller obſerves, into the common error of the writers of his time, who expected to find, in their own cold countries, the plants of thoſe more genial climates where the antients ſtudied botany and medicine. The publication of Fuchſius, though nearly on a par with thoſe of other learned men of his time, would probably have been long ſince forgotten, were it not for the tranſcendent merit of its wooden cuts, inferior to thoſe of Brunfelſius alone in execution, and far exceeding them in number. They chiefly indeed conſiſt of pharmaceutical plants, not of rare or difficult ſpecies like the works of Cluſius; but though mere outlines, they are juſtly celebrated for their fidelity and elegance. Theſe original editions are become very rare; but copies and tranſlations of them, various in merit, are common throughout Europe. Amongſt the pooreſt of theſe is a French duodecimo, printed at Lyons, under the title of Le Benefice Commun, in 1555, for which our author is certainly not reſponſible, and it is rather hard in Linnæus to claſs him, on account of ſome ſuch ſpurious editions, under the heads of *monſtroſi* and *rudes* in his *Bibliotheca Botanica*, though indeed he there properly ſtands amongſt the *uſitatiſſimi* with reſpect to his original edition. By ſome of his writings, eſpecially his *Cornarus furens*, publiſhed in 1545 againſt Cornarus, who had attacked his *Hiſtoria Plantarum* in a work entitled *Vulpecula excoriata*, he appears to have been vehement in controverſy, which perhaps is to be attributed more to the temper of the times in which he lived, and the example of the theologians, to whom, nevertheleſs, mankind are ſo much obliged, than to any original malignity of diſpoſition. In any caſe the chief reproach muſt reſt with the aſſailant who uſes ſuch vile weapons, and not with the party who merely defends himſelf; though certainly it is always more magnanimous and politic to repel them in ſilence with the invulnerable ſhield of conſcious ſuperiority. In his general character and deportment Fuchſius is ſaid to have been dignified and amiable, with a fine manly perſon, and a clear ſonorous voice. His piety, temperance, and indefatigable deſire to be uſeful, were alike exemplary. As a lecturer he was peculiarly admired and followed, eſpecially in his anatomical courſes. The famous Veſalius was preſent at one of his lectures, in which he found himſelf criticized. He afterwards familiarly addreſſed the profeſſor, ſaying "why do you attack me who never injured you?" "Are you Veſalius?" exclaimed Fuchſius. "You ſee him before you" replied the former. On which great mutual congratulations enſued, and a ſtrict friendſhip was formed between theſe learned men. Fuchſius was ſo famous throughout Europe, that the great Coſmo duke of Tuſcany invited him, with the offer of a ſalary of 600 crowns, to become profeſſor of medicine at Piſa, which he declined. The emperor Charles V. alſo bore teſtimony to his merit, by ſending him letters with the inſignia of nobility, which honour Fuchſius was ſo far from ſeeking, that he for ſome time declined it. He was indifferent to money, as well as to all other than literary fame. His great ambition was, whenever he undertook in his turn the rectorſhip of the univerſity, to promote good order, induſtry and improvement among the ſtudents, whom he governed with paternal aſſiduity and affection. Two colleges were always under his immediate care, one of them founded by duke Ulric for ſtudents of divinity alone, and more amply endowed by his ſon and ſucceſſor.

Fuchſius left behind him ſeveral unpubliſhed botanical manuſcripts, which received corrections and additions to the lateſt periods of his life, as well as many notes to the medical works he had formerly printed.—Melch. Adami, Vitæ Germ. Med.—Haller. Bibl. Bot. S.

FUCHSIA, in *Botany*, named by Plumier in honour of Leonhard Fuchs, or Fuchſius, of whom an account is given in the preceding article. Plum. Gen. t. 14. Linn. Gen. 53. Schreb. 255. Willd. Sp. Pl. v. 2. 339. Mart. Mill. Dict. v. 2. Dryand. in Ait. Hort. Kew. v. 2. 8. Juſſ. 320. Lamarck, t. 282. (Skinnera; Forſt. Gen. t. 29. Quelusia; Vandell. Fl. Luſit. et Braſil. Specim. 23. t. 2. f. 10. Nahuſia; Schneevoogt, Ic. t. 21.) Claſs and order, *Octandria Monogynia*. Nat. Ord. *Calycanthemæ*, Linn. *Onagræ*, Juſſ.

Gen. Ch. *Cal.* Perianth ſuperior, funnel-ſhaped, coloured, four-cleft, its ſegments equal, acute, deciduous. *Cor.* Petals four, rarely wanting, equal, inſerted into the rim of the calyx, alternate with its ſegments, and ſhorter Nectary a notched gland, crowning the germen. *Stam.* Filaments,

Filaments eight, longer than the tube of the calyx, and inserted into its base, thread-shaped, four of them usually shorter than the rest; anthers vertical, two-lobed. *Pist.* Germen inferior, oval, with four furrows; style thread-shaped, about the length of the stamens; stigma obtuse, with four notches. *Peric.* Berry oval, succulent, with four furrows and four cells. *Seeds* numerous, small, ovate, ranged vertically in two rows upon the columella in each cell.

Eff. Ch. Calyx superior, coloured, four-cleft, bearing the corolla. Petals four. Berry of four cells. Seeds numerous.

Obs. Linnæus, relying on Plumier's figure, has mistaken the calyx for a corolla, which he therefore describes as having eight marginal segments, and, owing to a further inaccuracy in the delineations of his original author, or at least in the engraved copies of them, he was induced to refer the genus erroneously to his fourth class instead of the eighth. Hence the real *Fuchsia* being widely misunderstood, some of its congeners have been established, by various names, as distinct genera; witness the above synonyms. We shall attempt a more complete enumeration and discrimination of the species than have hitherto been given. They are among the most elegant of all plants, though, as far as we know, not enriched with any fragrance, nor with any valuable medicinal or economical properties.

1. F. *triphylla*. Linn. Sp. Pl. 159. (F. triphylla, flore coccineo; Plum. Ic. t. 133. f. 1.)—Cluster terminal, naked. Leaves entire. Stem simple, erect.—Native of the West Indies, but it seems to be very rare. Plumier does not mention where he found this species, nor has any other person, as far as we can discover, met with it, except Thierry de Menonville, a specimen from whom, gathered in Hispaniola, was given by Thouin to the younger Linnæus, along with about 1200 of the finest and rarest plants, gathered by various French voyagers. The *stem* of this, the original species of *Fuchsia*, appears to be simple, herbaceous and erect. The *leaves* are three together in a whorl, sessile, oblong, about two inches in length, roughish, nearly entire, turned of a greyish brown by drying. *Flowers* in a simple, terminal, upright cluster, their calyx about an inch and half long, scarlet as well as the petals, which colour remains in the dried specimen. *Berry* almost globular, rather larger than a common black currant.

2. F. *simplicicaulis*. Ruiz and Pavon Fl. Peruv. v. 3. 89. t. 322. f. *a*.—Umbel terminal, of four flowers. Involucrum somewhat downy, four-leaved. Leaves lanceolate, toothed, smooth. Stem simple, drooping. Native of the woods of Munna in Peru, flowering in August and September. *Stem* rather shrubby, four feet high, simple, except now and then a radical shoot or two, leafy, drooping at the summit. *Leaves* four in a whorl, nearly sessile, linear-lanceolate, slightly toothed, drooping, very smooth. *Stipulas* intrafoliaceous, minute, deciduous. *Flowers* four together, drooping, forming a terminal umbel, with an involucrum of four ovate, pointed, toothed, rather downy, leaves. The umbel is sometimes proliferous. *Calyx* rose-coloured, downy, rather larger than in the former, and with longer teeth. *Petals* scarlet.

3. F. *apetala*. Ruiz and Pavon Fl. Peruv. v. 3. 89. t. 322. f. *b*.—Flower-stalks corymbose, terminal and axillary. Leaves scattered, ovate, entire. Petals wanting.—Plentiful in the woods of Huassahuassi and Munna in Peru, flowering in October and November. *Stem* shrubby, parasitical on the trunks of trees, downy, branched. *Leaves* alternate or scattered, stalked, ovate, entire, somewhat wavy, soft, and tender, scarcely an inch and half long. *Flowers* large, drooping, remarkable for having no petals. *Calyx* red, three inches in length. *Berry* red.

4. F. *rosea*. Ruiz and Pavon Fl. Peruv. v. 3. 88. "Flower-stalks axillary, single-flowered. Leaves fasciculate, unequal and alternate, lanceolate, entire."—Found on precipices at the port of Valparaiso in Chili, flowering in October and November. *Stem* shrubby, 10 or 12 feet high, erect, round, branched. *Branches* brittle. *Leaves* eight from one centre, unequal, stalked, lanceolate, entire, smooth; the upper ones alternate. *Flowers* drooping, with rose-coloured petals and calyx. Of this no figure is given in the *Flora Peruviana*, so we can only copy the description as above.

5. F. *serratifolia*. Ruiz and Pavon Fl. Peruv. v. 3. 86. t. 323. f. *a*.—Flower-stalks axillary. Leaves three or four in a whorl, ovate, stalked, serrated, smooth above, as long as the flowers.—Found in moist shady places at Munna in Peru, flowering from June to September, when it makes a very ornamental appearance. The *stem* is shrubby, two or three ells high, not much branched. *Leaves* either opposite, or three or four in a whorl, three to five inches long and one or two broad, spreading, slightly downy beneath, with numerous red veins, and red stalks. *Flowers* pendulous from each axilla, rather smaller than those of *F. apetala*, with a rosy-red, rather downy calyx, and scarlet petals. The tips of the calyx however are green. *Berry* purplish, elongated.

6. F. *denticulata*. Ruiz and Pavon Fl. Peruv. v. 3. 87. t. 325. f. *b*.—Flower-stalks axillary, reaching beyond the branches. Leaves three in a whorl, stalked, elliptic-lanceolate, toothed, shorter than the flowers.—Native of sunny precipices and banks at Huassahuassi and Cheuchin in Peru, blooming beautifully from March to October. This is a *shrub* about the size of the last, from which it differs in the toothed, not serrated, *leaves*, and in the extension of the *flowers* beyond the ends of the branches, their stalks proceeding from the bosoms of some of the upper leaves only. The *calyx* is purple. *Petals* rounded, scarlet. *Stamens* and *style* purple, not scarlet like the former. *Berry* purple.

7. F. *ovalis*. Ruiz and Pavon Fl. Peruv. v. 3. 87. t. 324. f. *a*.—Flower-stalks in leafy whorls, on simple axillary branches. Leaves opposite or three together, stalked, elliptical, wavy, downy on both sides. Calyx hairy. Native of the woods of Munna in Peru, flowering from June to August. A *shrub* about six feet high, upright and branched. The *leaves* are three inches long, broadly elliptical, acute, on downy stalks. *Flowering branches* shorter than the leaves, round, simple, downy, each bearing two or three whorls of small downy leaves, with a corresponding number of axillary simple flower-stalks. The *calyx* is not above an inch long in the tube, scarlet, hairy externally, like the germen and stalk. *Petals* scarlet, acute.

8. F. *corymbiflora*. Ruiz and Pavon Fl. Peruv. v. 3. 87. t. 325. f. *a*.—Cluster terminal, leafy, drooping. Leaves elliptic-lanceolate, nearly entire, downy. Calyx downy. Native of shady groves at Chincao and Munna in Peru, flowering in August and September.—A downy *shrub*, six feet high, but little branched. *Leaves* opposite, stalked, ovate or elliptic-lanceolate, pointed, very obscurely toothed, two or three inches long. *Flowers* about the size and colour of the first species, and, as in that, forming a whorled cluster, but drooping, downy, and accompanied at the base of each partial stalk with a small, ovate, downy leaf or bractea. *Berry* purplish-red, hairy.

9. F. *coccinea*. Dryandr. in Ait. Hort. Kew. v. 2. 8. Willd. Sp. Pl. v. 2. 340. Curt. Mag. t. 97. (F. macrostema; Ruiz

Ruiz and Pavon Fl. Peruv. v. 3. 88. t. 324. f. *b*. Nahufia coccinea; Schneevoogt Ic. t. 21. T'hilco; Feuillée Voy. v. 3. 64. t. 47.)—Flower-ftalks axillary, longer than the leaves, drooping. Leaves oppofite or whorled, ftalked, ovate, toothed, fmooth. Teeth of the calyx as long as its tube.—Native of Chili, in mountainous marfhy fituations, flowering from June to April. A *fhrub* from three to fix feet high, fmooth in all its parts, very much branched. *Leaves* two or three, rarely four, together, fcarcely above an inch, or inch and half, in length, rather diftantly toothed; paler and fhining beneath. *Flower-ftalks* longer than the leaves. *Calyx* fcarlet, with a much fhorter tube than any of the preceding. *Petals* violet, obovate and blunt. *Stamens* and *ftyle* fcarlet, hanging far out of the flower. *Berry* dark purple. The flowers are reported to be fometimes five-cleft and decandrous, of which we have never feen an inftance, and we much doubt whether it be not an error, originating with Feuillée. The people of Chili call this fhrub T'hilco and Chilco, and ufe it, in decoction or infufion, as a cooling medicine in inflammatory fevers. The wood is excellent for dyeing black. A plant of this fpecies, apparently in a dead ftate, was brought by Captain Firth in 1788 to Kew garden, from Lifbon, and it was faid to have come from the Brazils. As the fpring advanced, it began to fprout, and foon put forth its exquifitely beautiful flowers, to the admiration of all who beheld it. It is now become very common, being eafily encreafed by cuttings, and thriving equally well in a ftove, green-houfe or frame. The root ftands our winters in the open ground, though the ftems perifh, but as they fhoot up again, and flower with peculiar luxuriance in the fummer and autumn, this is perhaps the beft mode of treatment. When gathered, this plant foon withers, its evaporation being very rapid.

10. F. *decuffata*. Ruiz and Pavon Fl. Peruv. v. 3. 88. t. 323. f. *b*.—Flower-ftalks axillary, longer than the leaves, pendulous. Leaves oppofite or whorled, elliptic-lanceolate, flightly toothed, downy. Teeth of the calyx nearly as long as its tube.—Native of fhady moift places at Munna in Peru, flowering from July to September.—A *fhrub* about three feet high, apparently very nearly related to the laft, from which it differs in the downinefs, and taper bafes of its *l aves*, its fcarlet, more acute *petals*, and red *fruit*.

11. F. *lycioides*. Andr. Repof. t. 120.—Flower-ftalks axillary, fhorter than the leaves, drooping, Leaves fcattered, elliptic-lanceolate, wavy. Teeth of the calyx as long as its tube, reflexed.—Native of the north-weft coaft of America, from whence it was introduced to our gardens, according to Mr. Andrews, in 1796. It is lefs ornamental than any of the above defcribed, though not inelegant in its *flowers*, which, as well as the *leaves*, bear fome refemblance to a *Lycium*. The *calyx* is of a dull or pale red, and remarkable for being reflexed. *Petals* purple, about as long as the ftamens, but fhorter than the ftyle. *Berry* blackifh. It is increafed by cuttings, but is more tender than the far more defirable *F. coccinea*. We are at a lofs for the foundation of Mr. Andrews's "doubts whether this fpecies may not be the *F. triphylla* of Father Plumier," as the figure of the latter ftrikingly fhews their wide difference.

12. F. *excorticata*. Linn. Suppl. 217. Willd. Sp. Pl. v. 2. 340. (Skinnera excorticata; Forft. Prod. 27.)—Flower-ftalks axillary, fhorter than the leaves, drooping. Leaves elliptic-lanceolate, toothed, hoary beneath. Teeth of the calyx fhorter than the tube, fpreading.—Native of New Zealand. A *tree* fmooth in all its parts. The *trunk* is two or three inches in diameter. *Leaves* fcattered, ftalked, two inches long, varying in breadth, deciduous. *Flowers* larger than in *F. lycioides*, but fomewhat like them in the colour of the calyx, whofe teeth however are of a fhorter proportion, and not reflexed. The *petals* are fmall, acute, deep violet.

We might fwell our lift of fpecies with *F. multiflora*, taken up by Willdenow from the *Mantiffa* of Linnæus, p. 331, on the authority of Mutis, who merely mentioned to him that there were two fpecies of this genus in Mexico, one with many flowers on a ftalk, the other with fingle-flowered peduncles; but we prefume the former muft be included among thofe we have adopted from the *Flora Peruviana*. It is much to be wifhed that the Spanifh botanifts might introduce any of them to the gardens of Europe.

Fuchsia, in *Gardening*, comprehends plants of the flowery exotic kind for the ftove; of which the fpecies chiefly cultivated are, the three-leaved fuchfia (F. triphylla) and the fcarlet-flowered fuchfia (F. coccinea). The firft is an herbaceous plant of fmall growth, but the latter a fhrub of confiderable fize with beautiful fcarlet flowers.

Method of Culture.—Both thefe plants are capable of being increafed by fowing the feeds, by laying the young fhoots down, by cuttings made from the fhoots, and even fometimes by fuckers taken from the roots.

The feeds fhould be fown in pots filled with good light mould in the early fpring plunging them in a bark hot-bed. When the plants come up, they muft be kept clean, being occafionally refrefhed with a little water. As foon as they have attained a few inches in height, they fhould be carefully fhaken out of the old pots, and after being nicely feparated, be planted out in feparate fmall pots filled with the fame fort of mould, being replunged in the bark hot-bed, and kept well fhaded until they have taken frefh root, when they fhould have air admitted pretty freely.

The plants require to be kept warm during the winter feafon.

The layers, cuttings and fuckers may be laid down or be planted out towards the end of the fummer or the beginning of autumn, in pots for the purpofe, being occafionally watered, and placed in the hot-bed.

The plants fhould be kept in the ftove during the winter feafon, but they may be fet out in the green-houfe in the fummer months, when they will afford much ornament in their beautiful fcarlet flowers, as they continue for a confiderable length of time.

FUCHSWINKE, in *Geography*, a town of Silefia, in the principality of Neiffe; three miles S. of Patfchkau.

FUCINUS Lacus, in *Ancient Geography*, a lake of Italy in the Apennine mountains, belonging to the country of the Marfi. It is now called lake Celano. For a particular account of it, fee Celano.

FUCUS is ufed for a paint, or compofition, applied on the face, to beautify it, and heighten the complexion.

Old women make ufe of fucufes and pomatums, to appear young. The fucus made with ceruffe is corrofive and pernicious to the fkin.

Pliny fays, that the fucus of the Roman dames was a kind of white earth, or chalk, brought from Chio and Samos, diffolved in water.

The fucus Solimanni is a compofition of prepared fublimate, in great repute among the Spaniards of Peru.

Fucus *Giganteus*, a name given by Mr. Banks and Dr. Solander to a kind of fea-weed of an enormous fize, which they difcovered in their paffage from Rio de Janeiro to the ftrait of Le Maire. The leaves of it were four feet long, and fome of the ftalks, though not thicker than a man's thumb, above one hundred and twenty.

Fucus, in *Botany*, (from φυκος a fea-weed, fome kinds of which being ufed in colouring, occafioned the Latin

word

word *fucare*, to ſtain or paint.) Linn. Gen. 567. Schreb. 768. Juſſ. 6. Reaumur Mem. de l'Acad. des Sciences for 1711, 282. t. 9, 10, 11. Claſs and order, *Cryptogamia Algæ*. Nat. Ord. *Algæ*.

Gen. Ch. Male unknown. Female, *Cal.* and *Cor.* none. *Piſt* Germen imbedded in the gelatinous internal ſubſtance of a membranous or coriaceous frond, aggregate; ſtyle and ſtigma unknown. *Peric.* gelatinous. *Seeds* roundiſh, numerous, cluſtered, at length diſperſed.

Eſſ. Ch. Seeds produced in cluſtered tubercles, which burſt at their ſummits.

The fructification of this genus ſtill remains in the greateſt obſcurity. Linnæus imagined the male flowers to reſide in the ſpongy fibres found in the air-bladders of ſome ſpecies; but this appears to be merely cellular ſubſtance, thoſe bladders ſerving only to float the plant. Yet this theory, founded on a miſapprehenſion of Reaumur's opinion, is adopted by Juſſieu. Reaumur thought certain fibrous tufts, ſcattered over the ſurface, were male flowers. Gærtner has recurred to the old opinion that the family of ſea-weeds, and ſome others of the *Cryptogamia*, have no actual ſexual impregnation; but this does not bring us at all nearer the truth, though it may ſerve to ſhelter our ignorance. Mr. Correa de Serra, in the Philoſophical Tranſactions for 1796, has ſuggeſted that the mucus which envelopes the ſeeds of this family may be the true pollen or impregnating matter, which ſeems to us the moſt probable conjecture, though col. Velley, in the fifth volume of the Linnæan Society's Tranſactions, has oppoſed it. A great difficulty reſpecting, not only the generic character, but in many caſes the ſpecific diſcrimination of theſe plants, ariſes from the different aſpects the fruit aſſumes, being ſometimes in the form of round many-ſeeded tubercles, ſometimes in that of widely diſperſed ſeeds, like thoſe of an *Ulva*. This takes place unqueſtionably in the very ſame ſpecies. Theſe difficulties are ſo great, that though Roth and others have attempted generic diſtinctions among the plants ranged previouſly under *Fucus* and *Conferva*, Mr. Dawſon Turner, author of an excellent ſynopſis of the Britiſh *Fuci*, and of a ſplendid and very learned general work on this genus with coloured plates, in which 134 ſpecies have already appeared, leaves the ſubject of the generic character in complete uncertainty. The beſt books on the ſpecies of *Fucus* are Gmelin's *Hiſtoria Fucorum*, publiſhed at Peterſburgh, in 1768; Eſper's *Icones Fucorum*, Nuremberg 1800; Goodenough and Woodward's Obſervations on the Britiſh Fuci, Tr. of Linn. Soc. v. 3, beſides the works of Mr. Turner above-mentioned, and the ſplendid faſciculi of Stackhouſe's *Nereis Britannica*, and of Velley's *Plantæ Marinæ*. Numerous ſpecies are alſo figured and deſcribed in the Engliſh Botany. Thoſe which are natives of the Britiſh ſhores are now ſuppoſed to amount to near 100. They are diſtributed into the following ſections. 1. Leaves, or rather leaflets, diſtinct. 2. Leaves united with the ſtem. 3. Winged, or having a rib running along the centre of the leaf or frond. 4. Frond flat and deſtitute of a rib. 5. Frond compreſſed. 6. Frond round or cylindrical.

Theſe plants are eaſily preſerved, by being firſt waſhed clean from ſea water, and then diſplayed on paper while floating in a pan of freſh water, during which they are readily diſplayed by means of a briſtle, or hair-pencil. Some of them adhere to the paper when dry, others ſtart from it. Many ſpecies make a very elegant appearance, and are favourites with collectors of natural productions.

Fucus, in the teſtaceous claſs of *Vermes*, a ſpecies of *Murex*, which ſee.

Fucus, in the zoophyte claſs of *Vermes*, a name given by Imperatori to the Gorgonia *verrucoſa*, which ſee.—Alſo, to ſeveral ſpecies of *Alcyonium*, *Tubularia*, and *Corallines*, which ſee.

Fucus *palmatus*, *handed fucus*, the name given to a ſpecies of ſea fucus, diſtinguiſhed from the reſt by its having no ſtalks, its leaves being divided in the manner of a hand, and its extremities divided into many curled ſegments. It is common on almoſt all the ſea coaſts of Europe, and is one of the ſeveral ſpecies of ſea ſubſtances in which Mr. Reaumur has diſcovered regular flowers and ſeeds. They are in this ſpecies however ſo ſmall, as to require the aſſiſtance of a microſcope to diſcover them; though after they have been once ſeen in that manner, as is the caſe in many microſcopic objects, they may then be eaſily diſtinguiſhed by the naked eye. This ſubſtance is faſtened to ſome ſtone by a round root, from which there ariſe four or five leaves, which at about an inch diſtance from the root divide into a number of branchings, which conſtitute the whole of it. The natives of New Holland broil this ſpecies of ſea-wreck and eat it. It is alſo eaten both in Scotland and Ireland, ſometimes freſh, as a ſallad; but more frequently it is dried, rolled together, and chewed as tobacco. In the iſle of Sky it is uſed as a medicine.

Fucus *polyſchides*. See Polyschides.

Fucus *thermalis*, the name of a remarkable ſubſtance found only in the hot-water ſprings. It was firſt diſcovered by Monſ. de Monteſquieu, in the great baſon, at the boiling ſpring in Gaſcony; he was not able to diſcover that it produced either flowers or ſeeds. Its ſubſtance is entirely compoſed of ſmall bladders full of air, the ſurfaces of which are reticular, as worked in the manner of coarſe canvas. It is obſerved to grow only in the hotteſt waters.

FUDAL Baha, in *Geography*, a mountain of Aſiatic Turkey, in Natolia; ten miles from Cogni.

FUDDAH, a river of Algiers, which runs into the Shellif; five miles E. of Sinaab.

FUDDER, among the *Miners*, a load of lead, which is eight pigs, or ſixteen hundred weight. See Fodder.

FUDIA, in *Geography*, one of the Weſtern iſlands of Scotland, which is ſmall and mountainous. N. lat. 57° 2′. W. long. 7° 23′.

FUE′. See Faoue′.

FUEGO. See Terra *del Fuego*.

Fuego, Fogo, or *St. Philip*, one of the cape Verd iſlands. The firſt of theſe names is derived from a volcano, and the laſt from its being diſcovered on St. Philip's day. The volcano iſſues from a high mountain, and throws out flames, which are viſible at a great diſtance in the night; alſo clouds of aſhes, which ſuffocate cattle, pumice-ſtones, which float on the ſea, and torrents of ſulphur. The iſland has neither rivers nor freſh water; nevertheleſs it is fertile in maize, gourds, water-melons, wild figs, oranges, and apples. It abounds with goats, which run wild upon the mountains, the ſkins of which yield a revenue to the crown. They export alſo the ſkins of cattle, horſes, aſſes, and hogs. Fuego is about 15 miles in length. N. lat. 14° 57′ 18″. W. long. 24° 22′ 12″.

FUEGOO, one of the Philippine iſlands, about 36 miles in circumference; in the centre the land is pretty high, and declines towards both ends. N. lat. 9° 20′. E. long. 123° 26′.

FUEL, in *Philoſophy*, the pabulum of fire, or whatever receives and retains fire, and is conſumed, or rendered inſenſible thereby.

A great deal of nicety is required in chooſing the proper fuel to raiſe and continue the ſeveral degrees of fire in chemical operations. Dr. Black divides fuels into five claſſes;

classes; the first comprehends the fluid inflammable bodies; the second, peat or turf; the third, charcoal of wood; the fourth, pit-coal charred; and the fifth, wood, or pit-coal, in a crude state, and capable of yielding a copious and bright flame.

The fluid inflammables are considered as distinct from the solid, on this account, that they are capable of burning upon a wick, and become in this way the most manageable sources of heat; though, on account of their price, they are never employed for producing it in great quantities; and are only used when a gentle degree, or a small quantity of heat is sufficient. The species which belong to this class are alcohol and different oils.

The first of these, alcohol, when pure and free of water, is as convenient and manageable a fuel for producing moderate or gentle heats as can be desired. Its flame is perfectly clean, and free from any kind of soot; it can easily be made to burn slower or faster, and to produce less or more heat, by changing the size or number of the wicks upon which it burns; for as long as these are fed with spirit, in a proper manner, they continue to yield flame of precisely the same strength. The cotton, or other materials, of which the wick is composed, is not scorched or consumed in the least, because the spirit with which it is constantly soaked is incapable of becoming hotter than 174°, Fahrenheit, which is considerably below the heat of boiling water. It is only the vapour that arises from it which is hotter, and this too only in its outer parts, that are most remote from the wick, and where only the combustion is going on, in consequence of communication and contact with the air. At the same time, as the alcohol is totally volatile, it does not leave any fixed matter which, by being accumulated on the wick, might render it foul and fill up its pores. The wick, therefore, continues to imbibe the spirit as freely, after some time, as it did at the first. These are the qualities of alcohol as a fuel. But these qualities belong only to a spirit that is very pure. If, on the contrary, it be weak, and contain water, the water, being less volatile, does not evaporate so fast from the wick as the more spirituous part; and the wick becomes, after some time, so much soaked with water that it does not imbibe the spirit properly. The flame becomes much weaker, or is altogether extinguished. When alcohol is used as a fuel, therefore, it ought to be made as strong, or free from water, as possible.

Oil, although fluid like spirit of wine, and capable of burning in a similar manner, is not so convenient in many respects. It is disposed to emit soot; and this applying itself to the bottom of the vessel exposed to it, and, increasing in thickness, forms, by degrees, a soft and spongy medium, through which heat is not so freely and quickly transmitted. This was observed by Muschenbroeck in his experiments upon the expansions of metalline rods heated by lamps. It is true we can prevent this entirely, by using very small wicks, and increasing the number, if necessary, to produce the heat required. Or, we may employ one of those lamps, in which a stream of air is allowed to rise through the middle of the flame, or to pass over its surface with such velocity as to produce a more complete inflammation than ordinary. But we shall be as much embarrassed in another way, for the oils commonly used, being capable of assuming a heat greatly above that of boiling water, scorch and burn the wick, and change its texture, so that it does not imbibe the oil so fast as before. Some have attempted a remedy, by making the wick of incombustible materials, as asbestos, or wire; but still, as the oil does not totally evaporate, but leaves a small quantity of gross fixed carbonaceous matter, this, constantly accumulating, clogs the wick to such a degree, that the oil cannot ascend, the flames become weaker, and, in some cases, are entirely extinguished. There is, however, a difference among the different oils in this respect; some being more totally volatile than others. But the best are troublesome in this way, and the only remedy is to change the wicks often, though we can hardly do this and be sure of keeping always an equal flame.

The second kind of fuel mentioned, peat, is so spongy that, compared with the more solid fuels, it is unfit to be employed for producing very strong heats. It is too bulky for this: we cannot put into a furnace, at a time, a quantity that corresponds with the quick consumption that must necessarily go on when the heat is violent. There is, no doubt, a great difference in this respect among different kinds of this fuel; but this is the general character of it. However, when we desire to produce and keep up, by means of cheap fuel, an extremely mild gentle heat, we can hardly use any thing better than peat. But it is best to have it previously charred, that is, scorched, or burnt to black coal. When prepared for use in that manner, it is capable of being made to burn more slowly and gently, or will bear, without being extinguished altogether, a greater diminution of the quantity of air, with which it is supplied, than any other of the solid fuels. Dr. Boerhaave found it extremely convenient and manageable in his Furnus Studiosorum.

The next fuel, in order, is the charcoal of wood. This is prepared by piling up billets of wood into a pyramidal heap, with several spiracles, or flues, formed through the pile. Chips and brushwood are put into those below, and the whole is so constructed that, when kindled, it kindles almost over the whole pile in a very short time. It would burst out into a blaze, and be quickly consumed to ashes, were it not covered all over with earth, or clay, beaten close, leaving openings at all the spiracles. These are carefully watched; and, whenever the white watery smoke is observed to be succeeded by thin blue, and transparent smoke, the whole is immediately stopped; this being the indication of all the watery vapour being gone, and the burning of the true coaly matter commencing. Thus is a pretty strong red heat raised through the whole mass, and all the volatile matters are dissipated by it, and nothing now remains but the charcoal. The holes being all stopped in succession, as this change of the smoke is observed, the fire goes out for want of air. The pile is now allowed to cool. This requires many days; for, charcoal being a very bad conductor of heat, the pile long remains red hot in the centre, and, if opened in this state, would instantly burn with fury.

Small quantities may be procured at any time, by burning wood in close vessels. Little pieces may be very finely prepared, at any time, by plunging the wood in lead melted, and red hot.

This is the chief fuel used by the chemists abroad, and has many good properties. It kindles quickly, emits few watery or other vapours while burning, and when consumed leaves few ashes, and those very light. They are, therefore, easily blown away, so that the fire continues open, or pervious to the current of air which must pass through it to keep it burning. This sort of fuel, too, is capable of producing as intense a heat as can be obtained by any; but in those violent heats it is quickly consumed, and needs to be frequently supplied.

Fossil coals charred, called cinders, or coaks, have, in many respects, the same properties as charcoal of wood; as kindling more readily in furnaces than when they are not charred, and not emitting watery, or other gross smoke, while

while they burn. This ſort of charcoal is even greatly ſuperior to the other in ſome properties.

It is a much ſtronger fuel, or contains the combuſtible matter in greater quantity, or in a more condenſed ſtate. It is, therefore, conſumed much more ſlowly on all occaſions, and particularly when employed for producing intenſe melting heats. The only inconveniences that attend it are, that, as it conſumes, it leaves much more aſhes than the other, and theſe much heavier too, which are, therefore, liable to collect in ſuch quantity as to obſtruct the free paſſage of air through the fire; and further, that when the heat is very intenſe theſe aſhes are diſpoſed to melt or vitrify into a tenacious droſſy ſubſtance, which clogs the grate, the ſides of the furnace and the veſſels. This laſt inconvenience is only troubleſome, however, when the heat required is very intenſe. In ordinary heat the aſhes do not melt, and though they are more copious and heavy than thoſe of charcoal of wood, they ſeldom choke up the fire conſiderably, unleſs the bars of the grate be too cloſe together.

This fuel, therefore, is preferable, in moſt caſes, to the charcoal of wood, on account of its burning much longer, or giving much more heat before it is conſumed. The heat produced, by equal quantities, by weight, of pit-coal, wood-charcoal and wood itſelf, are nearly in proportion of 5, 4, and 3. The reaſon why both theſe kinds of charcoal are preferred, on moſt occaſions, in experimental chemiſtry, to the crude wood, or foſſil coal, from which they are produced, is, that the crude fuels are deprived, by charring, of a conſiderable quantity of water, and ſome other volatile principles, which are evaporated during the proceſs of charring, in the form of ſooty ſmoke or flame. Theſe volatile parts, while they remain in the fuel, make it unfit (or leſs fit) for many purpoſes in chemiſtry. For beſides obſtructing the vents with ſooty matter, they require much heat to evaporate them; and, therefore, the heat of the furnace, in which they are burnt, is much diminiſhed and waſted by every addition of freſh fuel, until the freſh fuel is completely inflamed, and reſtores the heat to its former ſtrength.

But theſe great and ſudden variations of the heat of a furnace are quite inconvenient in moſt chemical proceſſes. In the greater number of chemical operations, therefore, it is much more convenient to uſe charred fuel, than the ſame fuel in its natural ſtate.

There are, at the ſame time, ſome kinds of foſſil coal, which are exceptions to what has now been delivered in general. We meet with ſome of them that leave a ſmaller proportion of aſhes than others, and the aſhes of ſome are not ſo liable to melt in violent heats. There is one ſpecies too, ſuch as the Kilkenny coal of Ireland, and which occurs likewiſe in ſome parts of this country, that does not contain any ſenſible quantity of water, or other ſuch volatile principles. But this may be called a ſort of native charcoal. It has the appearance of ordinary coal, but, when thrown into the fire, does not emit ſmoke or ſoot. It merely becomes red, gives a ſubtile blue flame, and conſumes like charcoal; only it laſts ſurprizingly long, or continues to give heat for a very long time before it is totally conſumed. But it cannot be made to burn ſo as to produce a gentle heat. If not in conſiderable quantity, and violently heated, it is ſoon extinguiſhed.

In uſing this kind of fuel, it is proper to be on our guard againſt the dangerous nature of the burnt air, which ariſes from charcoal of all kinds. Charcoal burns without viſible ſmoke. The air ariſing from it appears to the eye as pure and as clear as common air. Hence it is much uſed abroad by thoſe who are ſtudious of neatneſs, and cleanlineſs in their apartments. But this very circumſtance ſhould make us more watchful againſt its effects, which may prove dangerous, in the higheſt degree, before we are aware of it. The air ariſing from common crude fuel is no doubt as bad, but the ſmoke renders it diſagreeable before it becomes dangerous. The firſt ſenſation is a ſlight ſenſe of weakneſs; the limbs ſeem to require a little attention, to prevent falling. A ſlight giddineſs, accompanied by a diſtinct feeling of a fluſh, or glow in the face and neck. Soon after, the perſon becomes drowſy, would ſit down, but commonly falls on the floor inſenſible of all about him, and breathes ſtrong, ſnoring as in an apoplexy. If the perſon is alarmed in time, and eſcapes into the open air, he is commonly ſeized with a violent head-ach, which gradually abates.

But when the effect is completed, as above deſcribed, death very ſoon enſues, unleſs relief be obtained. There is uſually a foaming at the mouth, a great fluſh or ſuffuſion over the face and neck, and every indication of an oppreſſion of the brain, by this accumulation of blood. The moſt ſucceſsful treatment is to take off a quantity of blood immediately, and throw cold water on the head repeatedly. A ſtrong ſtimulus, ſuch as hartſhorn, applied to the ſoles of the feet, has alſo a very good effect.

The fifth and laſt kind of fuel is wood, or foſſil coals, in their crude ſtate, which it is proper to diſtinguiſh from the charcoals of the ſame ſubſtances. The difference conſiſts in their giving a copious and bright flame, when plenty of air is admitted to them, in conſequence of which they muſt be conſidered as fuels very different from charcoal, and adapted to different purpoſes. See Flame.

Flaming fuel cannot be managed like the charcoals. If little air be admitted, it gives no flame, but ſooty vapour, and a diminution of heat. And if much air be admitted to make thoſe vapours break out into flame, the heat is too violent. Theſe flaming fuels, however, have their particular uſes, for which the others are far leſs proper. For it is a fact, that flame, when produced in great quantity, and made to burn violently, by mixing it with a proper quantity of freſh air, by driving it on the ſubject, and throwing it into whirls and eddies, which mix the air with every part of the hot vapour, gives a moſt intenſe heat. This proceeds from the vaporous nature of flame, and the perfect miſcibility of it with the air.

As the immediate contact and action of air are neceſſary to the burning of every combuſtible body; ſo the air, when properly applied, acts, with far greater advantage on flame, than on the ſolid and fixed inflammable bodies: for when air is applied to theſe laſt, it can only act on their ſurface, or the particles of them that are outermoſt; whereas flame being a vapour or elaſtic fluid, the air, by proper contrivances, can be intimately mixed with it, and made to act on every part of it, external and internal, at the ſame time. This great power of flame, which is the conſequence of this, does not appear when we try ſmall quantities of it, and allow it to burn quietly, becauſe the air is not intimately mixed with it, but acts only on the outſide, and the quantity of burning matter in the ſurface of a ſmall flame is too ſmall to produce much effect.

But when flame is produced in large quantity, and is properly mixed and agitated with air, its power to heat bodies is immenſely increaſed. It is therefore peculiarly proper for heating large quantities of matter to a violent degree, eſpecially if the contact of ſolid fuel with ſuch matter is inconvenient. Flaming fuel is uſed for this reaſon in many operations performed on large quantities of metal, or metallic minerals, in the making of glaſs, and in the baking or

 burning

burning of all kinds of earthen ware. The potter's kiln is a cylindrical cavity, filled from the bottom to the top with columns of wares, the only interftices are thofe that are left between the columns; and the flame, when produced in fufficient quantity, proves a torrent of liquid fire, conftantly flowing up through the whole of the interftices, and heats the whole pile in an equal manner.

Flaming fuel is alfo proper in many works or manufactories, in which much fuel is confumed, as in breweries, diftilleries, and the like. In fuch works, it is evidently worth while to contrive the furnaces fo that heat may be obtained from the volatile parts of the fuel, as well as from the fixed; for when this is done, lefs fuel ferves the purpofe than would otherwife be neceffary. But this is little attended to, or ill underftood in many of thofe manufactories. It is not uncommon to fee vaft clouds of black fmoke and vapour coming out of their vents. This happens in confequence of their throwing too large a quantity of crude fuel into the furnace at once. The heat is not fufficient to inflame it quickly, and the confequence is a great lofs of heat. See LABORATORY.

It is a known truth, that fuel cannot confume by means of heat alone, without the admiffion of frefh air, and this is no way more clearly proved, than by this eafy experiment. Let a ftrong cylinder of iron, hollow within, be fitted with a firm fcrew at each end; in the cavity of this cylinder enclofe a long piece of charcoal, an then fcrew up both the ends faft, and place the whole in a ftrong fire; let it continue there for feveral hours; and when it is taken out and cooled, open it, and the piece of charcoal will be found ftill black, in its own form, and no way apparently altered or diminifhed.

It is plain from this, that the confumption of fuel depends upon the rarefaction, diflodgment, brifk agitation, and difcharge of its inflammable vapour, by means of frefh air; and hence we have the reafon of the known rule of extinguifhing fires by fmothering them.

It is provided by ftatute, that wood fuel fhall not be felled under the affize. See BILLET and FAGGOTS.

FUEN, in *Geography*, a river of China, which runs into the Hoang, in the province of Chan-fi. N. lat. 35° 29'. E. long. 110° 14'.

FUENARABIA, or FUENTERABIA. See FONTARABIA.

FUENCALIENTE, a town of Spain, in Old Caftile, near the fource of the Xalon; 15 miles N. of Siguença.

FUEN-HOA-FOU, a city of China, in the province of Pe-tcheli, celebrated for its extent and the number of its inhabitants, as well as for the beauty of its ftreets and triumphal arches. It is fituated near the great wall, amidft mountains, and has under its jurifdiction, befides two cities of the fecond, and eight of the third clafs, a great number of fortreffes which bar the entrance of China againft the Tartars. Among the animals of the adjacent territory, the moft remarkable are yellow rats; which are much larger than thofe feen in Europe, and whofe fkins are much valued by the Chinefe. The contiguous mountains afford cryftal, marble, and porphyry.

FUENSALIDA, a town of Spain, in New Caftile; 18 miles N.N.W. of Toledo.

FUEN-SI, a town of China, of the third rank, in the province of Chan-fi; 12 miles W.N.W. of Teho.

FUEN-TCHEOU-FOU, an ancient and commercial city of China, in the province of Chan-fi, fituated on the river Fuen-ho; its baths and fprings, almoft as hot as boiling water, attract a great number of ftrangers, who contribute greatly to its opulence. To its diftrict belong one city of the fecond, and feven of the third clafs. N. lat. 37° 20'. E. long. 111° 26'.

FUENTE, LA, a town of Spain, in Afturia; 20 miles S.W. of Santillana.

FUENTE *Duenna*, a town of Spain, in New Caftile, fituated on the Tagus; 24 miles S.E. of Madrid.

FUENTE-*Ginaldo*, a town of Spain, in Eftremadura, ufed by the Spaniards in the fucceffion-war as a depôt for corn and cattle; 16 miles N.W. of Coria.

FUENTE *de Nanfa*, a town of Spain, in Afturia; 28 miles S.W. of Santander.

FUENTE-*el-Olmo*, a town of Spain, in Old Caftile, between Segovia and Aranda de Duero.

FUENTE *Ovejuna*, a town of Spain, in the province of Cordova; 32 miles N.W. of Cordova.

FUENTE *de la Piedra*, a village of Spain, in the province of Grenada, having a medicinal fpring, of virtues known to the ancients, and celebrated for curing various diforders, particularly the gravel; 6 miles from Antequera.

FUENTE *de la Reyna*, a town of Spain, in Valencia; 15 miles N. of Segorbe.

FUENTE *del Sabuco*, or *de Saburro*, a town of Spain, in the kingdom of Leon; 16 miles from Salamanca.

FUENTELSOL, a town of Spain, having a Carthufian monaftery, in Aragon, feated on the Ebro; 20 miles S.S.E. of Saragoffa.

FUENTES, FORT, a fort of Switzerland, founded by the count de Fuentes, governor of Milan, in 1603, completed in 1606, and called by his name. It is feated upon an infulated rock, about 1½ mile from the neareft ridge of mountains, and two miles from lake Como, fo that it completely commands the only great opening which leads into the Valteline, either from the Milanefe or the Grifons; and of courfe it was a fituation of great importance, when the poffeffion of the Valteline was an object of confequence to the houfe of Auftria. The fortifications are a quarter of a mile in circumference, conftructed with ftone, and contain a few ruinous barracks for foldiers, and the governor's houfe, which is in a wretched condition. The plain below the rock is marfhy, and renders the fort extremely infalubrious. The Spaniards were accuftomed to ftyle this place, from its peculiar fituation, the *yoke* of the Grifons, while the Grifons, in allufion to its bad air, termed it, with greater propriety, the *grave* of the Spaniards. The view from the fort is remarkably picturefque, on one fide the rich Valteline, watered by the turbulent Adda; on the other, the lakes of Como and Chiavenna, beautifully encircled with numerous towns and villages. The hills which fkirt the Valteline and the lake of Como prefent a variegated landfcape of forefts, cornfields, and paftures, finely contrafted, towards the Grifons, by the Rhætian Alps covered with eternal fnow.

FUENTES, a town of Spain, in the province of Leon; 13 miles N.W. of Placentia.

FUENTES *de Onoro*, a town of Spain, in the province of Leon; 13 miles W. of Cividad Rodrigo.

FUERTE *de St. Jofef*, a town of South America, in the province of Tucuman; 95 miles N.E. of St. Miguel de Tucuman.

FUERTE *de Valbena*, a town of South America, in the province of Tucuman, on the Salado; 60 miles E.N.E. of St. Miguel de Tucuman.

FUESSEN, or FUSSEN, a town of Germany, in the bifhopric of Augfburg, fituated on the Leech, and a frontier town to Bavaria and the Tyrolefe, with a Benedictine abbey.

abbey and convent of Franciſcans; 47 miles S. of Augſburg. N. lat. 47° 34'. E. long. 10° 43'.

FUESSLI, John-Gaspard, in *Biography*, an ingenious artiſt and writer, was born at Zurich in 1706; but having ſtudied the principles of painting under his father, he went to Vienna about the year 1724, without any means of ſupport, and without recommendations to thoſe whoſe patronage might be beneficial to him. Here, however, he attracted the notice of the principal nobility, and meeting with encouragement, in every reſpect adequate to his wants, he reſided at Vienna, till, at the earneſt ſolicitation of prince Schwarzenberg, he was induced to go to Radſtadt, where he became a favourite of the margravine, who was anxious to convert him to the Catholic religion. From Radſtadt he went to Nuremberg, where he formed an intimate friendſhip with the celebrated Rupezki, under whom he ſtudied, with a view to improve himſelf in his profeſſion. He next viſited Augſburg and Munich, and returned to Swiſſerland, where he arrived in his thirty-fourth year, and ſoon after married. His talents now claimed the reſpect of the moſt eminent artiſts. By Mengs he was preſented with a MS. treatiſe "On the Beautiful," which he publiſhed with a preface. With Winkelman he lived in the cloſeſt habits of friendſhip, and being as zealouſly attached to the beauties of poetry as he was famous as a painter, he maintained a correſpondence with Kleiſt, Klopſtock, Wieland, Bodmer, and other great men of the age. In the years 1740 and 1742, he loſt two of his beſt friends Rupezki and Rugendas, and being deſirous that men ſo eminent, and for whom he felt ſo ſtrong an affection, ſhould not be forgotten by poſterity, he wrote a biographical account of them. This, his firſt attempt in the department of literature, meeting with a very favourable reception, he ſet about reſcuing from oblivion ſome of his meritorious countrymen, by publiſhing as complete a hiſtory as poſſible of the artiſts of Swiſſerland. In this work, which he completed with great labour, perſeverance, and patience, he ſhewed himſelf a good writer and a ſound critic in the arts. He died at Zurich in May 1782, leaving behind him a moſt reſpectable character. He had very long been regarded as worthy the eſteem and friendſhip of perſons of the higheſt rank and eminence. But though accuſtomed to live with the great, he diſdained the arts of adulation, and was free and open in his manners and behaviour. His houſe was the reſort for thoſe who cultivated and were attached to the arts. His circumſtances were always very moderate, yet he was not deficient in his ſupport of men of letters, and was ready to ſerve thoſe who ſtood in need of his help. "Negligent," ſays his biographer, "in regard to himſelf, he was careful of others; and, though incapable of knocking at the doors of the great on his own account, he was not aſhamed to collect money from them when he had it in his power to contribute towards the ſupport of any child of misfortune." Moreri.

FUFA, in *Geography*, a town of Japan, in the iſland of Niphon; 140 miles W.N.W. of Jeddo.

FUGA, one of the iſlands called Barbuaynes, about 22 miles in circumference. N. lat. 19°. E. long. 121° 27'.

Fuga *Dæmonum*, in *Botany*, a name uſed by ſome authors for the hypericum, or St. John's wort.

Fuga, Ital. from *fugere*, Latin, to fly, a movement in *Muſic*, in which the leading part or firſt treble is purſued by the ſecond, the ſecond treble by the tenor, and the tenor by the baſe; ſo that a *fugue* is a *flight* and a *purſuit*. This ſubject has been ſo amply treated in the article Counterpoint, to which the reader is referred, that little remains to be added to it here, except to recapitulate its laws, and the doctrines of learned harmoniſts in ſupport of them. Rouſſeau defines a fugue "a piece of muſic in which a trait of melody, called the *ſubject*, is treated, according to certain eſtabliſhed rules of harmony and modulation in making it paſs ſucceſſively and alternately from one part to another." The ſubject reſembles the *text* of a ſermon, out of which all that is ſaid ſhould naturally ariſe, and ſerve as a commentary and illuſtration. But though, for variety, or to indulge caprice, fugues and canons have been compoſed in all intervals, yet orthodox contrapuntiſts allow no fugues to be regular, but thoſe of which the anſwer is made in the fifth, fourth, eighth, or uniſon, as then the intervals will be the ſame. And of the anſwers, the preference is given to the fifth, then to the fourth, eighth and uniſon; as the effect is pleaſing in that order. It muſt be remembered that the ſubject itſelf, as of all other movements, ſhould begin on the key note, its fifth or its eighth. Of the various rules by which a true anſwer to a fugue may be tried, Dr. Pepuſch adviſes *ſolmiſation*; Padre Martini the modes of the Romiſh church, called *authentic* and *plagal*; both good in the three hexachords and their minor relatives; but in tranſpoſed keys, in which ſeveral flats or ſharps occur at the clef, there is no rule more certain and unexceptionable than giving the anſwer in exactly the ſame intervals as the ſubject, only remembering that if one part riſes a fifth, the other will only riſe a fourth, as C ※ — G ※ — G ※ — C ※ — *et e contra*: as G — C ※ — C ※ — G ※. See Authentic, and Plagal. But this is only in leading off. The reſt of the anſwer muſt be in the ſame intervals, and characters for time, as the ſubject, except in prolation, augmentation and diminution, which give the anſwer in longer or ſhorter notes than the theme. See Prolation, Augmentation, and Diminution. All fugues and canons are *imitations*; but the term *imitation* is only applied to irregular fugues, when the intervals are not the ſame. The anſwer to a regular fugue may commence in the middle of the ſubject, which will unite them together, and make them reciprocally accompaniments to each other. It were impoſſible to enumerate all the ingenious contrivances that have been uſed in the works of great fughiſts. The following are the moſt frequent.

Fuga *per Arſin et Theſin*, or fugue in contrary motion.

Fuga *per Contrari Movimenti*.

Fuga *in Conſequenza*, is ſometimes uſed for canon.

Fuga *Omoſona*, a fugue in uniſon.

Fuga *Libera*, free fugue. A canon is ſo called.

Fuga *Legata*, and a ſtrict fugue, a canon.

Fuga *Perpetua*, perpetual fugue.

Fuga *Vacui*, in *Ancient School Philoſophy*, a ſuppoſed averſion in nature to a vacuum.

Moſt of the phenomena which the ancients aſcribed to the fuga vacui, the moderns have demonſtrated to ariſe from the gravity and preſſure of the air. This is the caſe in the aſcent of water in ſyringes, pumps, &c.

FUGALIA, in *Antiquity*, a feaſt celebrated among the Romans, ſuppoſed by ſome to be the ſame with the regifugium, held on the 24th of February, in memory of the expulſion of the kings, and the aboliſhing of the monarchical government. Struvius, Antiq. Rom. Syntag. cap. 9. diſtinguiſhes the fugalia from the regifuge; and even doubts whether the regifugium were thus called on account of the expulſion of the kings, or becauſe the rex ſacrorum, after the ſacrifice was ended, fled haſtily out of the forum and comitia.

Be this as it will, the only ancient author of note that makes expreſs mention of the fugalia is St. Auguſtine, De Civitate Dei, lib. ii. cap. 6. And his commentator Vives ſhews a great inclination to correct the reading of the word,

word, were it not that St. Auguftine adds, that the feaft was a true fugalia, all decency and modefty being banifhed from it.

That learned perfon conjectures, that the fugalia were the fame thing with the poplifugia, or the feaft of Fugia, the goddefs of joy, occafioned by the rout of an enemy, which was the reafon why the people abandoned themfelves to riot and debauchery; and that the feaft was firft inftituted on occafion of the victory gained over the Ficulnates, Fidenates, and neighbouring nations, upon their attempt to take poffeffion of Rome, the day after the people had withdrawn from it, as related by Varro, lib. v. de Ling. Lat.

But, according to Varro, the poplifugia which fell in the month of June, were held in memory of the flight or retreat of the people, in a fedition raifed among them: it is true, he adds, that the day followed foon after the retreat of the Gauls, and the time when the neighbouring nations confpired againft them: but this does not appear to have any relation to the poplifugia, being only meant to mark the era or time when the fedition and flight of the Roman people happened. After all, though the poplifugia might have been originally eftablifhed in commemoration of the flight of the people, and not that of the enemies, this does not hinder, but the fugalia of St. Auguftine may probably be the poplifugia of Varro, according to the conjecture of Vives.

FUGAM Fecit, in *Law*, a term ufed where it is found, by inquifition, that a perfon fled for felony, &c. And if flight and felony be found on an indictment for felony, or before the coroner, where a murder is committed, the offender fhall forfeit all his goods, and the iffues of his lands, till he is acquitted or pardoned; and it is held that when one indicted of any capital crime, before juftices of oyer, &c. is acquitted at his trial, but found to have fled, he fhall, notwithftanding his acquittal, forfeit his goods, but not the iffues of his lands, becaufe by the acquittal the land is difcharged, and confequently the iffues. 3 Inft. 218. H. P. C. 27. 2 Hawk. P. C. 450. The party may, in all cafes, except that of the coroner's inqueft, traverfe the finding of a fugam fecit; and the particulars of the goods found to be forfeited, may be always traverfed; alfo whenever the indictment againft a man is infufficient, the finding of a fugam fecit will not hurt him. 2 Hawk. 451. Making default in appearance on indictment, &c. whereby outlawry is awarded, is a flight in law.

FUGAS, in *Geography*, a river of Africa, which runs into the Indian fea, near Jubo, on the coaft of Zanguebar.

FUGHE, Ital. the plural of *fuga*, fugues. See Double Counterpoint.

During the rage for fugues, air, accent, grace, and expreffion were equally unknown to the compofer, performer, and the hearer; and whatever notes of one voice or inftrument were in tune with another, were welcome to the player, provided he found himfelf honoured from time to time with a fhare of the fubject, or principal melody; which happening more frequently in canons, and fugues, than in any other fpecies of compofition, contributed to keep them fo long in favour with performers of limited powers, however tirefome they may have been to the hearers, when conftructed on dull and barren themes. It has been faid by M. Marpurg (Traité de la Fugue), that fugues enjoy the privilege of greater longevity than any other fpecies of mufic. A good fugue is an evergreen, and never grows old-fafhioned; but then it muft be conftructed on a pleafing and fertile fubject, and carried on with fpirit; and a fugue on a dull and dry fubject, however correct the compofition, is a monotonous and tirefome compofition.

The greateft fughifts, in practice on the organ, during the laft century, were, doubtlefs, Sebaftian Bach and Handel; but the moft learned theorifts and writers on the fubject of fugue, whofe treatifes we have confulted and doctrines adopted, are Dr. Pepufch, Padre Martini, and the late Sig. Nicolo Sala. From the publications of thefe refpectable authors, we have given in the mufic plates, fubjects and fragments of fugues in 2, 3, and 4 parts, to fhew enquirers into the art what are regarded as true anfwers to regular fugues. But we inform the young ftudent, that even great fughifts, beftowing no thought on *melody*, befides their inattention to *phrafeology*, are equally indifferent about *accent*; fo intent is their fearch after harmony and contrivance, that if the accents of the anfwers are ever the fame as in the fubject, it is more by accident than defign. But if the accents of the anfwers differ from thofe of the theme, the imitation is imperfect, and the whole compofition becomes confufed and unintelligible.

FUGILE. The ceruminous fecretion of the ear; alfo an appearance in the urine like wax. The term has likewife two different furgical fignifications; fometimes it means a bubo; fometimes, a fwelling of the parotid gland.

FUGITIVA, La, in *Geography*, a fmall ifland in the Pacific ocean, difcovered by Quiros in the year 1606. S. lat. 14° 20′. W. long. 151° 50′.

FUGITIVE, *Refugee*, a perfon obliged to fly his country, or remove from a place where he had fome abode or eftablifhment, on account of his crimes, debts, or on other occafions.

In the Roman law, a fugitive flave was fuch a one as was apt to run away from his mafter. And in felling a flave, the mafter was obliged to declare, whether or not he were fugitive.

The term is alfo applied to deferters in an army, or thofe who fly from the combat.

Fugitives' *Goods*, *bona fugitivorum*, the proper goods of him that flies upon felony, which, after the flight lawfully found on record, do belong to the king, or lord of the manor. 5 Rep. 109.

Fugitives *over Sea*, are perfons that go over fea without the king's licence, who, unlefs they are merchants, or eminent perfons, or king's foldiers, forfeit their goods; and mafters of fhips, &c. carrying fuch perfons beyond fea, fhall forfeit their veffels; and alfo, if the fearcher of any port fhall negligently fuffer any perfons to pafs, he fhall be imprifoned, &c. Stat. 9 Edw. III. cap. 10. and 5 Ric. II. cap. 2. Thefe ancient ftatutes are obfolete, if not expired.

Fugitive *Pieces*, among the learned, denote thofe little compofitions which are printed on loofe fheets, or half fheets; thus called, becaufe eafily loft, and foon forgot.

FUGLOE. See Fogloe.

Fugue. See Fuga.

There are three kinds of fugues; the *fingle fugue*, *double fugue*, and *counter-fugue*.

Fugue, *fingle* or *fimple*, is fome point confifting of 4, 5, 6, or any other number of notes, begun by one fingle part, and then feconded by a third, fourth, fifth, and fixth part, if the compofition confifts of fo many, repeating the fame, or fuch like notes; fo that the feveral parts follow, or come in, one after another, in the fame manner, the leading parts ftill flying before thofe which follow.

Fugue, *double*, is when two or more different points move together in a fugue, and are alternately interchanged by feveral parts.

For the *Counter-fugue*, fee COUNTER-*fugue*.

The Italians fay, a *fugue*, or *flight of rooms*, or *chambers*, meaning a feries, or range of rooms, the doors whereof anfwer in a right line behind each other, fo as they may be all feen at once, from one extreme to the other.

FUHME, in *Geography*, a river of Germany, which runs into the Mulda, 2 miles S. of Regune, in the electorate of Saxony.

FUH-SANAH, a town of Africa, in the country of Tunis; 110 miles W.S.W. of Tunis.

FUHSE, a river of Germany, which runs into the Allier, near Zell.

FUIRENA, in *Botany*, fo named by Rottböll in memory of George Fuiren, a Danifh botanift. Rottb. Gram. 70. Linn. Suppl. 11. Nov. Gram. Gen. 25. Schreb. 40. Willd. Sp. Pl. v. 1. 255. Juff. 26. Lamarck, t. 39. Clafs and order, *Triandria Monogynia*. Nat. Ord. *Calamariæ*, Linn. *Cyperoideæ*, Juff.

Gen. Ch. *Cal.* Spike round, imbricated on all fides, with wedge-fhaped, channelled, three-keeled fcales, each tipped with a fhort ftraight awn *Cor.* Glumes three, rather membranous, inverfely heart-fhaped, flat, entire, with an incurved terminal awn. *Stam.* Filaments three, linear, inferted into the receptacle within the bafe of each glume of the corolla; anthers linear, erect. *Pift.* Germen fuperior, large, triangular; ftyle thread-fhaped; ftigmas two, revolute. *Peric.* none, except the withered corolla. *Seed* one, naked, triangular, deftitute of down.

Eff. Ch. Spike imbricated, with abrupt awned fcales. Corolla of three obcordate awned valves. Seed folitary, triangular, beardlefs.

1. F. *umbellata*. Rottb. Gram. 70. t. 19. f. 3. (F. paniculata; Linn. Suppl. 105.) Native of Surinam. *Stem* two or three feet high, fimple, angular, ftriated. *Leaves* fheathing, broadifh, ribbed, acute, glaucous; their fheaths hairy. *Flower-ftalks* axillary and terminal, bearing feveral feffile umbels of foft blueifh fpikes, half an inch long. This is the only fpecies, and is not known, except in a dried ftate, to European botanifts. Its habit is that of a *Cyperus* or *Scirpus*, but the glaucous hue is remarkable.

FULBERT, in *Biography*, a learned French prelate, who flourifhed at the latter end of the tenth and in the commencement of the eleventh centuries, was an Italian by birth. He was a difciple of Gerbert, who afcended the pontifical throne in 999, under the name of Sylvefter II. From Rome he came to France, and delivered public lectures. Here his fcholars were very numerous, who, imbibing the inftructions of their mafter, diffufed his learning and various information over France and Germany, and the other northern ftates of Europe, fo that Fulbert is juftly regarded as one of the principal reftorers of learning and of the fciences in that age. Some hiftorians affert that he was chancellor of France, but others contend that his chancellorfhip extended only to the church of Chartres. In 1007 he was appointed to the vacant fee of Chartres, and governed the church with great prudence upwards of twenty years. In conjunction with this bifhopric he held the treafurerfhip of St. Hilary at Poictiers, but he expended the profits of the fituation in rebuilding his cathedral church. Fulbert was highly efteemed by Robert, king of France, by Canute, and Richard II. of England; by the dukes of Normandy and Aquitaine, and by other eminent princes and great men of his time. He was author of many theological pieces, but the moft valuable extant is a collection of "Letters" by himfelf and friends, to the number of 134. He died in the year 1028. All his works were collected and publifhed in a feparate form at Paris in 1608: they are alfo inferted in the 17th vol. of the Bibliotheca Patrum. Fulbert was a friend to literature and fcience, but not in the beft fenfe of the term; for he was an enemy to freedom of enquiry, and a furious zealot againft thofe who ventured to diffent from any of the doctrines of the eftablifhed church. Moreri.

FULCIMENT, in *Natural Hiftory*, is a term for the plant-like bodies, formed by zoophytic animals, as habitations or fupports, and which, according to their confiftence, are denominated *coral*, *coralline*, or *fponge*, &c. The application of this term to the fcientific difcrimination and arrangement of organic foffils, or *reliquia* of this kind, will be found in Martin's "Outlines of the Knowledge of extraneous Foffils," p. 88. 97. and 103. See RELIQUIA.

FULCRA, in *Botany* and *Vegetable Phyfiology*, the Props, or rather Appendages, of the herbage of many plants. We prefer this latter term in Englifh, becaufe though the word *fulcrum* means a prop or fupport, it is, in that fenfe, not applicable to more than one kind of the organs in queftion, the tendril. See CIRRUS.

Thefe appendages are of feven kinds.

1. *Stipula*. The Stipula or Stipulas. Thefe are an appendage to the proper leaves or to their footftalks, commonly fituated at the bafe of the latter, in pairs, as in the Rofe, the Pea family, and others. In the Coffee, *Gardenia*, and others of the Rubiaceous family, as well as in the common genus *Polygonum*, they are intrafoliaceous and fimple, embracing the ftem within (or above) the leaf-ftalks. In thefe cafes the Stipulas are permanent; in the Tulip-tree, *Liriodendron*, they are in pairs, and fall off as the leaves unfold. In graffes the fimple ftipula crowns the infide of the fheath of their leaf. This is idly termed *ligula* by fome, for it is a real *ftipula*.

2. *Bractea*. The Floral Leaf. This is a leafy appendage proper to the flower or its ftalk, various in form and duration, fometimes coloured, as in the Purple or Pink-topped Clary, *Salvia Horminum*.

3. *Spina*. A Thorn. Proceeds from the wood itfelf, being a modification of the materials of a bud, and is found in *Hippophae*, *Rhamnus*, and various fpecies of *Cratægus* or *Mefpilus*. It is liable to difappear by culture.

4. *Aculeus*. A Prickle. Arifes from the bark only, and is ftripped off with it, having no connection with the wood. Examples are found in the Rofe, Bramble, and Goofeberry. The prickle does not difappear in confequence of culture like the *Spina*.

5. *Cirrus*. A tendril or clafper, by which moft climbing plants are fupported upon others. To this the word prop is therefore juftly applied. See CIRRUS.

6. *Glandula*. A gland, or little tumour difcharging a fluid, as in the vifcid clothing of the calyx and ftalk of a Rofe, efpecially the Mofs-rofe, and many fimilar inftances. The liquor difcharged is either refinous, and often aromatic, or fweet and vifcid like honey.

7. *Pilus*. A Hair, including the various rough, hairy, or downy clothing of plants. This in the nettle confifts of an excretory duct, difcharging a venomous fluid through each hair or briftle, and the fame holds good in divers plants whofe hairy coats exude a clammy moifture, to all which the Linnæan idea of a *pilus* is fuitable, that it is "an excretory duct, of a briftle-like form," differing therefore in fhape only from the *glandula*. But in the greater number of cafes the hairs are merely a protection againft cold, heat, or animals. They are often hooked, forked, branched, or entangled. Very generally they are curioufly jointed and tubular; fometimes they are flat, like minute fhavings; fometimes,

fometimes, as in Viper's Buglofs, they are bulbous or tuberous at the bafe, and as hard as a fhell in that part. The hairs of many of the Mallow family, and fome fpecies of *Croton* and *Solanum*, are beautifully and curioufly ftellated, and compofe fometimes a foft, fometimes a very harfh coat to the whole of the leaves, ftalks, and calyx.— The pubefcence of plants varies greatly in degree according to circumftances, but its direction is found to be very conftant, affording good fpecific characters in *Mentha*, *Myofotis*, and *Fragaria*. In the latter the pofition or direction of the hairs feems to be afcertained with more certainty after the plants are dried, which may account for its having been generally overlooked. See Fragaria.

FULCRUM, Prop, in *Mechanics*. See Lever and Hypomochlion.

FULDA, Charles-Frederic, in *Biography*, was born at Wimpfen, in Swabia, and educated at the gymnafium of Stuttgard, near Tubingen. In the year 1748 he was appointed chaplain to a regiment in Holland. When this was difbanded, which happened in a few months, he made a tour through various parts of Germany, and in 1749, completed his ftudies at Gottingen. His firft literary production was a prize differtation on the principal dialects of the German language, which was crowned by the Royal Society of Gottingen, and the facts and reafonings of which he introduced, fome years after, in his "Dictionary of the German Roots." After this he publifhed another work, entitled an "Enquiry into Language." He did not confine his refearches to language alone, but extended them to hiftory and antiquities in general. Of this he gave various proofs in his many publications; but his principal work, and which is regarded as a treafure of hiftorical knowledge, ingenuity, and inventive genius, is his Chart of Hiftory, publifhed at Augfburg in 1783. In early life he was accuftomed to render different objects of knowledge eafier to be retained in the memory by graphic reprefentations; and when he was farther advanced he exhibited, in a fort of genealogical tree, the connection of all the fciences, profeffions, arts, and handicrafts. He reprefented, in a fimilar manner, in 1787, all the organs of fpeech, with the origin of human language. Fulda died at Einzigen, in December 1788. Though he devoted his intellectual endowments to the cultivation of language, and the inveftigation of its principles and philofophy, yet he was converfant with all the fciences; and was an excellent practical mechanic; made his own houfehold furniture; alfo implements for weaving; and worked them himfelf with great fuccefs. Gen. Biog.

Fulda, in *Geography*, a bifhopric and principality of Germany, in the circle of the Upper Rhine, bounded on the N. by Heffe-Caffel, on the E. by the county of Henneberg, on the S. by the bifhopric of Wurzburg, and on the W. by the principality of Ifenburg and Heffe; about 40 miles in length, and from 7 to 25 in breadth. The country is mountainous and woody, with fome rich arable lands, and fome falt and medicinal fprings. From being a cloifter of Benedictine monks, erected in 744, this bifhopric was formed in 1752 by pope Benedict XIV. In 1802 this bifhopric was given to the prince of Naffau Dillenberg, late Stadtholder, as an indemnity for this office, and his dominions in Holland.

Fulda, a city of Germany, and capital of the abovementioned bifhopric, fituated on the river Fulda. It was made a town in the year 1162; and became the refidence of the bifhop. Befides the cathedral, it has a collegiate church, an univerfity founded in the year 1734, a college, an academy, and a convent of Benedictines. It is fituated nearly in the centre of the diocefe; the chapter of which is compofed of thirteen canons. The library contains a number of ancient and rare manufcripts. It is diftant 63 miles E.N.E. from Mentz. N. lat. 50° 33′ 57″. E. long. 9° 43′ 45″.

Fulda, a river of Germany, in the circle of Upper Rhine, which paffes by the town of Fulda, and joining the Werra at Minden, their confluence forms the Wefer.

FULFULÆ, in *Ancient Geography*, a town of Italy, in the country of the Samnites.

FULGENIA, or Fulgeneva, Foligni, or Foligno, in *Geography*, a town of Italy, in Ombria.

FULGENTIUS, in *Biography*, an African prelate in the fixth century, was a defcendant from an illuftrious family of Carthage, but born at Lepte, in the province of Byzacena, about the year 468. He was early introduced to the ancient languages, and made fo much progrefs, that while he was a boy he could repeat the whole of Homer, and even converfe in the Greek language with purity and fluency. At a proper age he was recommended to a poft under government, which, however, not being agreeable to his mind, he relinquifhed, in order that he might retire from the world and embrace a religious life. Fulgentius entered a monaftery under the difcipline of Fauftus, and when this community was difperfed by perfecution, he entered into another, where the high opinion entertained of his fanctity and zeal occafioned his being appointed colleague with Felix, the fuperior of that inftitution. The Moors, in a fhort time, fcattered in all directions the religious of this monaftery, and Felix and Fulgentius were fubjected to much cruel perfecution and perfonal fufferings. Fulgentius afterwards embarked for Egypt, but having touched at Syracufe he was perfuaded to abandon the idea of proceeding on his voyage. He went to Rome in the year 500, and having offered his devotions at the pretended fepulchres of the apoftles, returned to Africa, where he eftablifhed a new monaftery; but his attachment to a folitary way of life led him to defire a greater degree of privacy, and he refolved to withdraw to a fecluded fpot among the Venetian Iflands. His fuperiors, however, infifted upon employing his talents in the catholic caufe, and compelled him to return to his monaftery, under the penalty of incurring excommunication. He was now ordained prefbyter, and in 504, or as others affirm in 508, he was confecrated bifhop of Rufpa. After this he was banifhed in common with the other catholic bifhops of Africa to the ifland of Sardinia: here, though a junior among his brethren, he was called upon, from the known fuperiority of his talents, to exercife his pen in the vindication of themfelves and their depreffed caufe. In the year 522 Fulgentius, and his fellow-fufferers, were recalled and met with a joyful reception from the orthodox in Africa. Fulgentius appears to have fpent the remainder of his life in tranquillity, difcharging the duties of his epifcopate with great diligence and prudence, and rendering himfelf highly ufeful by his piety and exemplary manners. He was frequently appointed to prefide at the fynods which were held by his party. He died in the year 533, leaving behind him numerous treatifes in theological controverfy. Fulgentius has been praifed for the correctnefs and clearnefs of his creed, his intimate knowledge of the facred fcriptures, his eloquence in addrefs, and his fubtlety in argumentation. He has been called the Auguftine of his age, becaufe he not only conformed to the tenets held and juftified by that father, but imitated his ftyle. He had many good qualities, but thefe were debafed by the fuperftitious notions of religion and devotion that he had early imbibed: and by the credit of his character and influence, the fpirit of monkery was widely diffeminated among the chriftians in Africa.

FULGO,

FULGO, in *Geography*, a river of Hindooftan, which runs into the Mahany; 10 miles N.N.W. of Bahar.

FULGORA, in *Entomology*, a genus of hemiptera in the Linneæan fyftem, *Ryngota* of Fabricius, and *Orthoptera* of Lamarck, and later French writers.

This genus is characterifed by having the head hollow, inflated, and extended forward; the antennæ fhort, feated beneath the eyes, and confifting of two joints, the outer one larger and globular; beak elongated, inflected, and containing four joints; and the legs formed for leaping.

The fulgora feem to have entirely efcaped the attention of European naturalifts till within the fpace of the laft century, when an interefting account, accompanied with figures, of the fpecies lanternaria appeared in the coftly volumes of Madame Merian's "Infectorum Surinamenfium;" and about the fame period the defcription of another example of the fpecies was given by Dr. Grew of London, in his work entitled "Mufeum Regalis Societatis." The hiftory of this infect, as related by Merian, is indeed furprifing, and was much difcredited in the firft inftance, notwithftanding that the account given by that lady was in part corroborated by the teftimony of Dr. Grew, and fo far as refpected the luminous property of that extraordinary creature, her veracity is completely confirmed by his authority. The paffage to which we chiefly allude is to the following effect: "Onee" fays Madame Merian "when the Indians brought me a number of thefe lantern carriers, I put them into a wooden box, without being aware of their fhining at night; but one night being awakened by an unufual noife, and much frightened, I jumped out of bed and ordered a light, not knowing whence the noife proceeded. We foon perceived that it originated in the box, which we opened with fome inquietude, but were ftill more alarmed, after opening it and letting it fall on the ground, for a flame appeared to iffue from it which feemed to receive additional luftre, as often as another flew out of it. When we obferved this fome time, we recovered from our terror, and admired the fplendour of thefe little animals." "Differt. de Generatione et Metamorphibus, &c." Thefe remarks are fanctioned by Grew, when he obferves that the circumftance "which befide the figure of the head is moft wonderful in this infect (Cucujus Peruvianus) is the fhining property of the fame part, whereby it looks at night like a lantern, fo that two or three of thefe faftened to a ftick, or otherwife conveniently difpofed of, will give fufficient light to thofe who walk or travel in the night."

Relations fimilar to the above are given by the miffionaries who traverfed South America; nor does the fact appear to be contefted except by Renard, who, in contradiction to thofe writers, affures us that this extraordinary infect does not emit light. That Madame Merian has committed a ferious though perhaps hitherto undetected error in delineating this fulgora as the offspring of the great cicada of Surinam, is very evident, and the commiffion of this alone fhould incline us to be cautious in repofing implicit reliance on her obfervations; but as to the actual exiftence of phofphoric light in this individual fpecies of fulgora, as recorded in her publication, we cannot reafonably entertain the flighteft doubt. It is even poffible that obferver of nature may be correct, and Renard alfo, fince, like the lampyrides, the infect may poffefs the power to difplay or withdraw its luminous appearance at pleafure, or this appearance may be affumed only at particular feafons, and in that cafe probably at the period of their amours. Whether however the light emitted by this fpecies of fulgora be permanent or not, it is fufficiently evident on the teftimony of thofe who have witneffed its fhining properties, that the light produced is remarkably powerful and clear. Pere du Tertre declares in his "Hiftoire des Antilles" that he could diftinctly read his prayers by the light of one of them; and Leffer, in his "Theologie des Infectes," affirms that the Indians keep them in their houfes, and require no other light in the night time; an infect of this fort being fufficient fo far to illuminate an apartment of moderate fize, as to enable its inhabitants to perform whatever houfhold work may be neceffary.

The fulgora lanternaria was the only fpecimen of this fingular tribe of infects known, till about the middle of the eighteenth century, when that curious and very abundant kind the Chinefe lantern-carrier (F. Candelaria) was brought to Europe. An account of this infect was given by Roefel, who at the fame time obferves, that he had never feen or heard of it in the works of any author. The tranfactions of the Stockholm academy include however the earlieft figure and defcription of this fpecies, and it was from this fource Linnæus introduced it into his Syftema Naturæ. At firft Linnæus referred it with the great lantern-carrier to the coleopterous order, under the appellation of lanternariæ; in a fubfequent edition they are incorporated with his cicadæ, and laftly they were allowed to conftitute a diftinct genus under the name which they retain at prefent.

The details afforded in the works of the above-mentioned writers, refpecting the luminous properties of thefe infects, awakened confiderable attention among naturalifts, as we learn from Degeer, Seba, Reaumur, and others; and fome progrefs was alfo made in the afcertainment of other fpecies of the fame tribe, efpecially by the firft of thofe authors, notwithftanding which, however, it is only within the laft twenty or thirty years that we have become acquainted with the greater number of the fpecies which compofe the genus at this time. It does not appear that more than ten fpecies were known to Linnæus, and thofe including all that were defcribed by Degeer, Seba, and others of his predeceffors, but the total amount of thofe inferted in the works of Fabricius, Drury, Stoll, Donovan, and others, have increafed that number to about thirty fpecies.

The light differninated by the luminous kinds of fulgora, (for it does not appear that all the fpecies inherit this property) is generally imagined to iffue from the trunk, or elongated projection of the forehead, but Roefel offers a conjecture on that emitted by the fulgora lanternaria, which on further inveftigation may enable naturalifts to determine whether the light be entirely produced by an innate property of the trunk, or whether the infect does not receive at leaft an additional degree of fplendour from fome external caufe. He notices a white farinaceous fubftance befprinkled over various parts of the wings and body, as well as the trunk, which he obferves looks like wood in that ftate of decay when it affumes a fhining afpect in the dark. The fame idea has occurred to us: we have frequently, if not invariably, found a fimilar white powder on other infects of this genus, which are known to be of the luminous kinds; and it is therefore poffible, in our opinion, that its prefence may tend to increafe, though it does not abfolutely excite, that vivid glow of light which thefe infects unqueftionably exhibit.

Reaumur endeavoured to difcover the origin of this phofphoric appearance in the fulgora lanternaria, and found, on diffecting the trunk, that it was completely empty, which is indeed the truth in all the fpecies of this tribe we have examined. But the obfervation advanced by Reaumur, as a late French author (Latreille) has well remarked, proves nothing, becaufe it is very likely that in the living infect this cavity is filled with fluid matter, which dries or evapo-

rates with the other juices of its body after the inſect dies, and therefore, that until an opportunity be afforded to ſome intelligent naturaliſt to inſpect the trunk of the living inſect, we muſt remain in uncertainty whether that organ be excluſively the ſeat of that animated phoſphoric matter which renders the creature luminous, or whether, as before remarked, the farinaceous dots may not contribute, in a greater or leſs degree, to increaſe the ſplendour of its appearance. For a more ample diſcuſſion of this intereſting ſubject the reader may be referred to the remarks on the fulgora candelaria, in Donovan's "Inſects of China," and thoſe of fulgora pyrrorhynchus, feſtiva, and hyalinata, in the "Inſects of India," by the ſame author.

Species.

Lanternaria. Front extended, ſtraight; wing-caſes variegated; wings with a large ocellated ſpot on each. Linn.

A ſpecies far exceeding the reſt in magnitude, its length being from three to four inches, and the expanſion, when the wings and wing-caſes are extended, about ſeven inches. The trunk is remarkably large in proportion to the ſize of the inſect, and of a yellowiſh brown colour ſimilar to that of the wing-caſes; the wings in general rather paler. The whole ſurface is prettily variegated with dots of brown and black, and on the trunk in particular are a few conſpicuous ſpots of bright red on each ſide. When in fine condition, the wings, wing-caſes, and body, both above and beneath, are moſt elegantly dotted with ſpecks of fine white powder, but which is of a texture ſo extremely delicate as to rub off with almoſt the ſlighteſt touch of the finger. This is the powder before mentioned, and which is ſuppoſed to poſſeſs the property of emitting a phoſphoric light. It is a native of South America.

Candelaria. Front extended, aſcending; wing-caſes green, ſpotted with yellow; wings yellow, with black tips. Linn.

Der kleinere Aſiatiſche oder Chineſiſche lanternen-trager, Roeſ. *De gewapende cicade*, Stoll. *Chineſe lantern-carrier*, Donov. Inſ. China.

This inſect is found in great abundance in ſome of the Chineſe provinces, and is occaſionally brought, with other inſects, common in that empire, to the European factories for ſale as an object of curioſity. It is a ſpecies of elegant appearance, and when in fine preſervation is obſerved to be beſprinkled with a kind of farinaceous ſubſtance on the wings and body, ſimilar to that on the fulgora lanternaria, though in a very inconſiderable degree.

Serrata. Front roſtrated, aſcending, and armed with four ſeries of ſerrations. Seba, &c.

This extremely curious and uncommon ſpecies of fulgora is a native of Surinam; and is in ſize the ſame as that of the Chineſe lantern-fly; in form it alſo nearly correſponds, but the four diſtinct ſeries of ſharp teeth with which the extended ſnout is furniſhed, independently of its diſſimilarity in colour, at once remove this inſect, not only from the Chineſe ſpecies, but from every other of the fulgora tribe. The wing-caſes are brown, and the wings reddiſh, with an elegant ocellated ſpot near the tip. The only example of this intereſting inſect we are acquainted with is in the cabinet of A. Macleay, Eſq.

Diadema. Front extended, muricated, and trifid at the tip; wings black with red margin. Linn. *Fulgora armata*, Drury.

A rare ſpecies found in India.

Pyrrhorhynchus. Trunk aſcending; apex red; wing-caſes brown with a pale band acroſs the middle; wings black, at the baſe green. Donov. Inſ. India.

Deſcribed from an unique ſpecimen brought many years ago from the interior of Hindooſtan by governor Holford. Its general outline is not unlike that of the Chineſe lantern-fly, fulgora candelaria, which latter however it materially exceeds in ſize. The colours are remarkably vivid in this inſect, yet nothing is more worthy of mention than the peculiar beauty of its trunk, the organ through which the "living light" is diffuſed; this is of a very rich and deep purple, from the baſe upwards to the apex, and the apex itſelf of a fine ſcarlet, and ſomewhat pellucid. The nocturnal appearance of this extraordinary creature, when on the wing, is conceived to be infinitely more ſingular than that of any known ſpecies of fulgora, the lampyrides, or other luminous inſects yet diſcovered, as the illuminated apex muſt naturally reſemble a globule of fire, or heated iron, and the numberleſs phoſphoric dots, relieved by the purple colour of the tube, appear like a train of glittering ſtars behind it.

The only figure of a fulgora in any reſpect reſembling this ſpecies is given in the work of Stohl, under the title of "De Groote Goene Coromandelſche Lantaarndrager" (green lantern-carrier fly of Coromandel). The general aſpect of theſe latter inſects accords with the preſent ſpecies, except in the ſtructure of the trunk, which is altogether different, being recurved, tapering gradually from the baſe to an acute point at the apex, and of an olive black colour. The following account of this inſect is given by Stohl "In De Nederlandſche Kabinetten," &c. "This inſect was not known in the cabinets of the Low Countries till within the laſt three years (A.D. 1780.) during which time a few were brought from Tranquebar, on the Coromandel coaſt, to the cabinet of natural curioſities of his royal highneſs the Stadtholder of the United Provinces, of which I have been obligingly permitted to take the figure of a female, by Monſ. Voſmar, to whom I owe my public acknowledgments for it." The rarity of the above deſcribed inſects will afford a ſufficient apology for the introduction of theſe little anecdotes concerning them.

Phosphorea. Front ſubulate, extended, and aſcending; body grey glaucous. Linn. *Cicada filiroſtris*, Degeer.

Native of Surinam.

Noctivida. Front roſtrated, pointed, and aſcending; body green; wings hyaline. Linn. *Cicada coniroſtris*, Degeer.

Inhabits ſame country as the preceding.

Lucerna. Front roſtrated and prominent; body above greeniſh, beneath yellow. Linn. *Cicada breviroſtris*, Degeer.

A South American ſpecies.

Flammea. Front roſtrated, aſcending, roundiſh, and truncated. Linn.

Native of South America.

Tenebrosa. Front roſtrated, ſtraight, and truncated; wing-caſes ſcabrous and grey. Fabr. *Cicada lanternaria fuſca*, &c. Degeer.

The head of this inſect is fuſcous, with the front rufous; thorax and wing-caſes rough with raiſed dots; and the wings duſky. Inhabits Guinea.

Obscurata. Front roſtrated, ſtraight, and truncated; wing-caſes cinereous with black ſpots. Fabr. Donov. Inſ. New Holland.

An inſect of ſmall ſize, deſcribed by Fabricius, from the Bankſian cabinet: the ſpecies inhabits New Holland; its ſnout is the length of the body, of a black colour with the baſe white, and marked with white dots, and two white bands;

bands; the thorax is brown; wings white, and legs black and white varied.

Adscendens. Front extended, afcending, and fubulate; wing-cafes ferruginous brown, dotted with white. Fabr.

A native of Cayenne, defcribed by Fabricius, from the cabinet of Rohr. The fize of this infect is fmall; the fnout above black, beneath yellow; head beneath yellow with two oblique black ftreaks, and a black dorfal line above; wings hyaline; body yellow, and border of the abdomen black on the back.

Fasciata. Frontr oftrated and afcending; wing-cafes ferruginous brown, with two green bands, and a dot of green behind. Fabr.

Inhabits fame country as the laft, and is about the fame fize; the head is conic and grooved, yellow with the back brown; thorax brown; body yellow; and abdomen rufous above.

Truncata. Front fomewhat obtufe; wings green and truncated. Linn.

Native of India.

Plana. Front extended, flat, and yellowifh; thorax and wing-cafes ferruginous. Fabr.

A fmall fpecies found in Cayenne; the head is grooved beneath; anterior edge of the thorax yellow; wing-cafes hyaline at the tip; body yellow; abdomen above ferruginous.

Hyalinata. Front conic, and unequal; wing-cafes hyaline, with a black ftreak. Fabr. Donov. Inf. India.

This curious infect, and which till very lately was confidered extremely rare, is found according to Mr. Fichtel (who brought a number of them to Europe) in very confiderable abundance in the vicinity of Bengal. Its fize is moderate; the front conic, unequal above, and grooved beneath; the colour pale, inclining to brownifh, with ftreaks and fpecks of black. The eyes are large, white, and globular; thorax pale fpeckled with black; the wings hyaline, with a black fpot at the tip.

Pallipes. Front extended and flat; wing-cafes green, with hyaline tips. Fabr.

Size of fulgora plana; the head black, with a whitifh margin extending entirely round; the thorax greenifh, with a black blotch on the fore part; wing-cafes rather yellowifh at the bafe, with a ftreak of black fpots at the tip; beneath yellow; wings hyaline.

Folium. Front extended, fhort, and ftraight: body yellow-green; wings very large, vertical and compreffed. Degeer.

Native of America.

Festiva. Front conic; wing-cafes brown, the outer margin greenifh, with black and fulvous dots; wings red at the bafe. Fabr. Donov. Inf. India.

Inhabits Coromandel. The head is flat above and of a brown colour, beneath yellowifh edged with black; thorax brown; wings fanguineous red with the tips brown.

Europæa. Front conic; body green; wings hyaline and reticulated. Linn.

Native of France and Germany, and has been once difcovered in England. Vide Donov. Britifh Infects. The fize is fmall, fcarcely exceeding that of the carrion or flefh fly; the colour throughout a delicate pea-green; the wings and wing-cafes hyaline, with the nerves of the fame green colour as the body.

Fenestrata. Front conic, and furrowed; wing-cafes hyaline, with a marginal fufcous fpot. Fabr.

An African fpecies defcribed from the Bankfian cabinet; it is rather lefs than the laft; the front yellowifh; wings without fpots.

Minuta. Front conic; head and thorax yellowifh; dorfal line and wing-cafes whitifh. Fabr.

A fmall fpecies found in Saxony; the antennæ are fhort and thick; body entirely yellowifh, with a white dorfal line on the head and thorax, and the wing-cafes pale.

Limbata. Fufcous with hyaline wing-cafes, marked with two brown fpots on the difk, and many on the borders; the nerves punctured. Fabr.

Size of the laft, and alfo inhabits Saxony; the antennæ are fhort, thick, and fetaceous at the tip; wing-cafes longer than the body; wings hyaline and immaculate.

Pellucida. Brown; wing-cafes white, hyaline, and immaculate. Fabr.

Native of Saxony. The body entirely brown, and the legs teftaceous. Size of the former.

Flavescens. Yellowifh; wing-cafes hyaline and without fpots. Fabr.

The antennæ of this fpecies are fhort, thick, and cetaceous at the end; the head and thorax yellowifh without fpots; body yellowifh. This inhabits Saxony, and is of the fame fize as the preceding.

Striata. Yellowifh; head black and ftriated; wing-cafes yellowifh, hyaline, and immaculate. Fabr.

Refembles the foregoing in fize, and alfo inhabits Saxony. The head is black ftriated with yellow; thorax yellowifh, and the abdomen beneath black at the bafe.

Marginata. Black; head ftreaked with yellowifh; anterior edge of the thorax with the legs yellowifh; wing-cafes hyaline. Fabr.

This correfponds in fize with the former; the antennæ are dufky and thick, and the head black with three yellowifh ftreaks; the body black, and the legs yellowifh. A native of Saxony.

Fabricius, who defcribes the five laft mentioned infects, from examples in the cabinet of Hybner, fuggefts at the fame time, that though he admits them among the fulgora, it is poffible they ought rather to conftitute a new genus, fince they not only differ in their general habit from the true fulgora, but alfo in the ftructure of their antennæ, which latter objection is certainly materially worthy of confideration in the eftablifhment of an effential character. We may perhaps befides add, with fome propriety, in fpeaking of this genus generally, as adopted both by Linnæus and Fabricius, that fome advantage would arife to the entomologift, were thofe fpecies of the fulgora which have the trunk confiderably elongated, to be removed from thofe which have the front very flightly advanced, or projected at leaft in fuch an inconfpicuous degree as rather to approach the cicada than fulgora tribe. The latter we conceive might conftitute a diftinct genus.

FULGOSIO, Raphael, in *Biography*, generally fuppofed to be a native of Placentia, was profeffor of the law in the college there, and likewife at Pavia. He afterwards occupied the profeffor's chair at Padua, where he had a large falary. For his great knowledge in jurifprudence he was fent to the council of Conftance, and was of great ufe to that affembly by his dexterity and profound knowledge. He was often delegated on public bufinefs to Venice. He died in 1427, and a very fplendid monument was erected to his memory in the church of St. Anthony at Padua. He was author of many learned works, as Commentaries upon the Code and Digeft, Councils, &c. Moreri.

FULGURATING phosphorus, a term ufed by fome Englifh writers to exprefs a fubftance of the phofphorous kind, the preparation of which does not feem to have been well known to any but the inventor of it. It

 was

was prepared both in a liquid and a dry form, and not only ſhone in the dark in both ſtates, but communicated its light to the things it was rubbed on. If incloſed in a glaſs veſſel well ſtopped, it ſometimes would fulgurate, or throw out little flaſhes of light, and ſometimes fill the whole vial with waves of flame. It does not need recruiting its light at the fire, or in the ſunſhine, like the phoſphorus of the Bolonian ſtone, but of itſelf continues in a ſtate of ſhining for ſeveral years together, and is ſeen as ſoon as expoſed in the dark; the ſolid or dry matter always reſembling a burning coal of fire, though not conſuming itſelf. Phil. Tranſ. Nº 134. See Phosphorus.

FULHAM, in *Geography*, a village of England, in the county of Middleſex, ſeated on the Thames, over which is a bridge, which is ſubject to a toll for foot paſſengers, as well as cattle and carriages. In 1801 the number of inhabitants were 4428. The biſhop of London has a palace here; 4 miles W. of London.

FULICA, in *Ornithology*, a genus of the grallæ, with the bill convex, the upper mandible arched over the lower at the edge, and the lower gibbous near the tip; noſtrils oblong; front bald, and feet four-toed and pinnate. The genus is divided into two families, gallinule and coot; the firſt of which have the feet cleft, the other pinnate; this is the arrangement adopted by Linnæus. Some writers conſider theſe families as generically diſtinct, allowing only thoſe with pinnated feet to remain in the genus fulica, and conſtituting the others as a genus under the name of gallinule. The latter appears to be the moſt correct diſtribution of theſe birds according to their natural character, as they not only differ in the ſtructure of their feet, but in other eſſential particulars. The gallinules have the upper mandible membranaceous at the baſe, and the wings concave: the coots have the mandibles equal, and the noſtrils oval, narrow, and ſhort. Both tribes frequent watery places, and feed on worms, inſects, and ſmall fiſh.

Species.

Fusca. Front and bracelets yellowiſh; body browniſh. Gmel. *Fulica albiventris*, Scop. *Gallinula minor*, Briſſ. *Rallus Italorum*, Geſner. *Poulette d'eau*, Buff. *Brown Gallinule*.

This bird inhabits France, the neighbourhood of Venice, and other ſouthern parts of Europe. Its haunts are the ſame as that of the common gallinule, but though it frequents the ſame places, it never aſſociates with that ſpecies, its diſpoſition being ſhy and ſolitary. The fleſh is in eſteem.

The length of this bird is about 12 inches. There is another analogous kind, and which is commonly conſidered as a variety, ſuperior to this in ſize, the length being 18 inches. The latter is the gallinula major of Briſſon; the body is cheſnut above, beneath cinereous, with the feathers edged with white; head and neck blackiſh, and the lower part of the belly white.

Chloropus. Front tawny; bracelets red; body blackiſh. Scop. *Gallinula chloropus major*, Aldrovandus. *Poule d'eau*, Buff. *Common water-hen, or moor-hen*, Ray. *Common gallinule*, Lath. Donov. Britiſh Birds, &c.

The moor-hen is a native of America as well as Europe, and is about fourteen inches in length. Though from the ſhortneſs of the wings it flies with difficulty, it runs with great facility, and ſwims well. It frequents the borders of ponds, and rivers that are ſheltered with weeds, and builds near the water ſide upon low trees or ſhrubs; the neſt is compoſed of herbage, and contains about ſeven eggs, which are of a yellowiſh white colour, marked with irregular brown reddiſh ſpots. Theſe birds lay twice or thrice in the ſeaſon.

The bill of this bird is red with the tip greeniſh; the irides red; body above ſooty black mixed with olive, beneath cinereous; the outer edge of the wings and lower tail-coverts white, and legs greeniſh.

Viridis. Above greeniſh, beneath white; front, bill, and legs greeniſh yellow. Gmel. *Porphyrio viridis*, Briſſ. *Poule ſultane verte*, Buff. *Green gallinule*, Lath.

A native of the Eaſt Indies. The length of this kind is eleven inches and a half; the bill of a greeniſh yellow; body above dull green, beneath white; the legs greyiſh yellow, with grey claws.

Melanocephala. Blue; head and neck black. Gmel. *Porphyrio melanocephalos*, Briſſ. *La Poule ſultane à tête noir*, ibid. *Black-headed gallinule*, Lath.

Entirely blue, except the head and neck, which are black, and a broad bare ſpace on the crown. In the female the crown and body above is tawny, the ſhoulders ſtreaked with white; wings greeniſh tinged with tawny, and the quill-feathers greeniſh blue. Native of America.

Purpurea. Purple; bill pale; legs greeniſh yellow. Gmel. *Acintli*, Buff. *Quachilto*, Ray. *Crowing gallinule*, Lath.

Inhabits the marſhes of New Spain, and crows like a cock; the fleſh is good; called by the natives of Mexico yacacintli.

Flavirostris. Above azure; throat blueiſh-white; belly and rump white; wings and tail brown; bill and legs yellow. Gmel. *La favorite de Cayenne*, Buff. *Favourite gallinule*, Lath.

Length 12 inches. Inhabits Cayenne.

Porphyrio. Front red; bracelets many; body green, beneath violet. Gmel. *Poule ſultane, et taleve de Madagaſcar*, Buff. *Purple water-hen*, Albin. *Purple gallinule*, Lath.

The bill and legs are red, irides tawny; head and neck above gloſſy violet; cheeks and throat violet-blue; back and rump gloſſy green; wings and rounded tail ſhining green; within brown. Size of a fowl, the bill and legs ſtout, the former compreſſed at the baſe. The female ſmaller than the male. This ſpecies inhabits in a greater or leſs abundance all the warmer parts of the globe; the female forms its neſt in reeds in marſhy places; lays three or four eggs, and ſits from three to four weeks. They are eaſily tamed, and domeſticated with the common poultry, and feed on fiſh, roots, fruits, ſeeds, and other ſimilar ſubſtances, and occaſionally, it is ſaid, like the parrot, will ſtand on one leg and lift the food to the mouth with the other. The fleſh is exquiſite.

Violacea. Black violet; neck beneath blue; front and legs red. Lath. *Violet gallinule.*

Found with the laſt. The vent is white.

Carthagena. Front blue; body rufous. Gmel. *Carthagena gallinule.*

Deſcribed by Jacquin as a native of Carthage in America. Size of the large black coot.

Cayanensis. Grey-brown; breaſt and upper part of the belly rufous, back and wings olive; chin whitiſh. Lath. *Grand poule d'eau de Cayenne*, Buff. *Cayenne gallinule.*

Very common in ſome parts of South America, where it frequents marſhy places, and feeds on fiſh and inſects. The bill is duſky at the tip; legs red, back tinged with olive. The length is eighteen inches.

Ruficollis. Crown, neck above, with the back and quill-feathers brown; chin white; throat and breaſt rufous; belly,

belly, vent, and rump black. Gmel. *Black-bellied gallinule*, Lath.

The length of this bird is feventeen inches, the bill two inches and a half, red at the bafe, and at the tip yellow. The quill-feathers are rufous at the margin; flanks and lower wing-coverts fafciated with rufous and black. The legs long and red. Native place uncertain, but fuppofed to be Cayenne.

Maderaspatana. Front and temples white; body above cinereous, beneath white. Gmel. *Porphyris maderafpatanis*, Briff. *Angoli*. Buff. *Madras rail-hen*, Ray. *Madras gallinule*, Lath.

Inhabits the coaft of Coromandel and Malabar, where it is known by the names of Boollu-cory, and Camangoly. Its fize is that of the common duck. The throat is marked with femi-circles; the quill-feathers cinereous, edged with black, and the bill and legs very long.

Martinicensis. Front and bracelets blue; body violet. Jacquin. *Porphyrio minor*, Brifl. *Petite poule-fultane* Buff. *Martinico gallinule*.

Lefs than the common gallinule, being in length only twelve inches; the bill rather exceeds an inch, and is of a yellow colour, with the bafe red; the eyes are black; legs yellow; back and upper part of the wings greenifh-brown; tail blackifh above, beneath white. Inhabits the Weft India iflands.

Novæboracensis. Legs brown; crown, and neck above olive fpotted with white; back brown; breaft dirty yellow. Gmel. *Yellow-breafted gallinule*. Arct. Zool.

Size of a quail. The fpecies inhabits New York.

Nævia. Bill and legs greenifh; front faffron; feathers of the head and upper parts of the body black edged with rufous; margin of the dorfal feathers white; eye-brows white; wings and tail brown. Gmel. *Porphyrio nævius*. Briff. *Grinette*, Buff. *Small water-hen*. Albin. *Grinette gallinule*, Lath.

Length nine inches and three-quarters; the irides yellowifh-green: chin, throat, and breaft blueifh-afh fpotted with black; tail-feathers on the outer edge, and two middle ones on both edges, white. Inhabits Italy.

Maculata. Above reddifh-brown; front and bill yellow; temples and throat white; wings fpotted black and white; breaft, belly and tail brown; two middle tail-feathers black tipt with white. Gmel. *Porphyrio punctulatus*, Briff. *Matkneltzel*, *Matkern*, Ray. *Speckled gallinule*.

Inhabits marfhes in Germany; its length is eleven inches; the bill of a dull yellow colour, and the legs grey.

Flavipes. Front and legs yellowifh; head, body above, and tail rufous, fpotted with black; beneath white; wings black. Gmel. *Porphyrio rufus*, Briff. *Gallinula ochropus major*, Ray. *Smirring*, Buff. *Yellow-legged gallinule*, Lath.

Native of Germany. The bill is yellow with black tip; margin of the eye-lids faffron; temples white; greater wing-coverts next the body white. Size of the common moor-hen.

Fistulans. Front yellowifh-green; body above brown. Beneath white, wings and tail brown. Gmel. *Porphyrio fufcus*, Briff. *Glout*, Buff. *Piping gallinule*, Lath.

Inhabits borders of rivers in Germany, and feeds chiefly on fmall fifhes, worms, and infects.

Cinerea. Cinereous, middle of the belly white. Gmel. *Crefted gallinule*. Lath.

Defcribed from a fpecimen in the Britifh Mufeum, which is fuppofed to have been brought from China. The length is eighteen inches. Forehead and crown bare, of a reddifh colour, and rifing into a knob at the back part, in a manner not unlike the caruncle on the head of the pintado; the chin is ftriped with white; the back and wings greenifh-afh, the latter pale on the outer margin.

The above-mentioned fpecies are of the gallinule, and the following of the coot tribe.

Atra. Front flefh-colour; bracelets greenifh-yellow; body blackifh. Scopoli. *Fulica*, Bellon. *Phalaris*, Gefner. *Foulque ou Morelle*, Buff. *Common coot*, Lath. Donov. Brit. Birds, &c.

A general inhabitant of Europe, Afia, and America; frequents marfhy places, and forms a floating neft among the rufhes; the eggs are numerous, of a dirty-white colour, fprinkled with minute fpots of deep ferruginous. The young fwim and dive with amazing facility almoft as foon as hatched. Thefe birds feed on fmall fifhes, aquatic infects and feeds, and in the winter feafon are often found near the fea. The bill is yellowifh-white, and the front white, except in the pairing feafon, when it becomes red; the legs are greenifh-yellow, and the outer edge of the wings white.

Aterrima. Front white, bracelets red; body blackifh. Gmel. *Fulica major*, Briff. *Grande foulque ou macroule*, Buff. *Blaefling*, Günther. *Greater coot*.

Differs from the laft in being larger, and is perhaps not fpecifically diftinct from that kind. Found in Europe and Siberia.

Americana. Cinereous; front, chin, and line in the middle of the belly white; legs blue-black. Gmel. *Cinereous coot*.

Larger than the common coot, and inhabits South America.

Aethiops. Entirely black. Sparrman Muf. Carlf. Native place uncertain.

Mexicana. Purple; front and bill red; back, wings and rump greenifh. Gmel. *Tohoalcoachillin*, Ray. *Mexican coot*.

Inhabits New Spain, and is larger than the common coot. The bill is yellow at the tip; back, rump and wing-coverts varied with blue and tawny.

Cristata. Blue-black; naked front and crown red; caruncle red, bifid, and erect. Gmel. *Grande foulque a crête*, Buff. *Crefted coot*.

Length eighteen inches; bill whitifh, with the bafe red, and legs dufky; bracelets of three colours, red, green, and yellow. The fpecies inhabits Madagafcar and China.

FULIGINOUS, an epithet applied to a thick fmoke, or vapour, replete with foot or other crafs matter. See Smoke.

The word is formed from the Latin *fuligo*, foot, and is rarely ufed but when joined with vapour.

In the firft fufion of lead, there exhales a great deal of fuliginous vapour, which retained and collected, makes what we call *Litharge*; which fee.

Lamp-black is what is gathered from the fuliginous vapours of pines, and other refinous woods, when burnt. See *Lamp-Black*.

FULIGO Metallorum, a term ufed by the chemifts, fometimes to exprefs arfenic, and fometimes crude mercury.

FULIGULA, in *Ornithology*, a name given by Gefner to a fpecies of duck, feeming to be the fame with a kind common on the Yorkfhire fhores; the *anas marila* of Linnæus. See Duck. The fame author alfo defcribes another fpecies under the name of *anas fuligula prima*, which feems the fame with the *capo negro*, or *tufted duck*. See Duck.

FULKE, William, in *Biography*, was born in London about the middle of the fixteenth century. In 1555 he was fent to St. John's college Cambridge. From this univerfity he entered himfelf a ftudent at Clifford's Inn London, and applied moft diligently to the ftudy of the law: but he had a fecret defire of quitting legal enquiries for theological inveftigation, and returned to his college to purfue that courfe of ftudy that fhould ultimately fit him for the church.

 His

His father, difpleafed at the change, refufed to contribute to his fupport. By the help of friends he contrived to maintain himfelf till he was chofen fellow of his college in the year 1564, and diftinguifhed himfelf by his proficiency in the different branches of learning, particularly in mathematics and theology. In the following year, when he was M. A. of three years ftanding, he was incorporated in the fame degree in the univerfity of Oxford. Having formed an intimate acquaintance wi.h the learned Thomas Cartwright, who was attached to the fentiments of the puritans, Mr. Fulke embraced the fame opinions, and is defcribed by Anthony Wood, as jointly with Dr. Humphrey " ftandard bearers, for a long time of the non-conformifts, who did grow conformable in the end, as they grew riper in experience and fager in judgment." By the public avowal of his fentiments, he rendered himfelf fo obnoxious, that he was expelled his college, and obliged to maintain himfelf by delivering lectures in his private apartments. After this he was patronized by the earl of Leicefter who prefented him to the living of Warley in Effex, and afterwards to that of Didington in Suffex ; he then took his degree of doctor in divinity at Cambridge by mandamus, and went to France in the capacity of chaplain to the Englifh embaffy. Upon his return he was appointed mafter of Pembroke hall, and lady Margaret's profeffor. He died in 1589 : as a young man he fuftained the character of a good philofopher, and in more advanced life, that of a pious and folid divine. He was author of numerous treatifes, chiefly controverfial, but the moft important of his works is a " Comment upon the Rheims Teftament," firft publifhed in 1580, and reprinted in 1617, with the title of " the Text of the New Teftament of Jefus Chrift, tranflated out of the vulgar Latin by the papifts, &c. with arguments of books, chapters, and annotations, pretending to difcover the corruption of divers tranflations : whereunto is added the tranflation out of the original Greek, commonly ufed in the church of England, with a confutation of all fuch arguments," &c. He was author likewife of " A Defence of the fincere and true Tranflation of the Holy Scriptures into the Englifh Tongue againft the cavils of Gregorio." Martin. Gen. Biog.

FULL is varioufly ufed, in oppofition to empty, narrow, confined, &c.

The Cartefians hold, that the univerfe is full, *i. e.* that every part or point has matter in it.

An ambaffador has full power given him to act, tranfact, &c. The army was in full march, *i. e.* the whole army was in march, with all the forces it confifted of.

A man is faid to bear the arms of a family full, *i. e.* without any difference or diminution.

Full *Age*. See Age, in *Law*.

Full *Arms*. See Arms.

Full *Forfeiture*. See Forfeiture.

Full *Moon*, *plenilunium*, that phafis of the moon, when her whole difk or face is illuminated ; which is in the time of her oppofition to the fun.

Eclipfes of the moon always happen at or near the time of full-moon. See Eclipse.

Full *and by*, a *Sea-phrafe*, denoting a fituation of a fhip with regard to the wind, when fhe is clofe-hauled, and failing in fuch a manner, as neither to fteer too nigh the direction of the wind, nor to deviate to leeward, both of which movements are unfavourable to her courfe : as in the former her fails will fhiver, and render the effort of the wind precarious and ineffectual ; and in the latter fhe will advance in a direction widely diftant from her real courfe. Hence, "keep her full" is the order from the pilot or other officer, to the helmfman, not to incline too much to windward, and thereby fhake the fails fo as to retard the courfe. Falconer.

FULLER, a workman employed in the manufactories, to full, mill, or fcour cloths, ratcens, ferges, and other woollen ftuffs, by means of a mill, to render them thicker, and more compact and durable.

The word is formed of the Latin *fullo*, which fignifies the fame thing.

The fullers among the Romans wafhed, fcoured, and fitted up cloaths ; and their office was judged of that importance, that there were formal laws prefcribed them for the manner of performing it. Such was the Lex Metalla de Fullonibus. See alfo Pliny, lib. vii. cap. 56. Ulpian, leg. 12. ff. de Furtis, lib. xiii. § 6. Locati, lib. xii. § 6 ff. &c. See Fulling.

FULLER, Nicholas, in *Biography*, a learned Englifh divine, was born at Southampton in the year 1557, where he received his education. After this he was taken into the family of Dr. Horne bifhop of Winchefter, and had an ample opportunity of purfuing his ftudies, till at length he was made fecretary to that prelate. Upon the death of bifhop Horne, he was chofen to the fame office under Dr. Watfon his fucceffor, but in the courfe of a few months he determined to retire, in order that he might devote himfelf to literary purfuits, more congenial to his temper than a life of active bufinefs. Before his plans were well arranged, he was invited to become the tutor to the fons of a gentleman in Hampfhire, two of whom he accompanied to the univerfity of Oxford in the year 1584, and matriculated, at the fame time with them, as a member of St. John's college. Having fpent fome time in this learned feminary, and having taken both his degrees in arts, he was admitted to orders, and prefented with a fmall living in Wiltfhire ; and though its income was very inadequate to his comfortable maintenance, yet he felt contented, as it afforded him leifure to apply himfelf to his literary and critical ftudies. His fkill in the learned languages, and his publications tending to illuftrate the fcriptures, gave him confiderable celebrity, but it was not till late in life that he obtained any fubftantial reward for his various merits. He was at an advanced age made prebendary of Salifbury, and preferred to the rectory of Bifhop's Waltham in Hampfhire, which he did not long enjoy. He died in 1622-3, at the age of fixty-five years. His works are the " Mifcellanea Theologica," and a defence of the fame againft Drufius, who had charged him with plagiarifm. The " Mifcellanea," are inferted in the ninth volume of the " Critici Sacri," and they may be found difperfed in Pool's " Synopfis Criticorum." He was author of " An Expofition of Rabbi Mordecai Nathan's Hebrew Roots with Notes ;" and a " Lexicon," which remain in M. S. in the Bodleian library.

Fuller, *Nicholas*, contemporary of the preceding, was a barrifter, who boldly refifted the oppreffion of archbifhop Bancroft, and his brethren of the high-commiffion court, againft a minifter and a merchant of the town of Yarmouth, who were imprifoned for being prefent at a conventicle, as it was denominated. He obtained a writ to bring them to the bar, when he moved for their liberation upon the principle that the high commiffioners were not impowered by law to imprifon any of his majefty's fubjects. His pleas were ineffectual for his clients, and at the advice of Bancroft, who affected to regard Fuller as the champion of the non-conformifts, this vindicator of the rights of the fubject, was himfelf fhut up in clofe confinement, and there kept till the day of his death.

Fuller, *Thomas*, fon of an eminent clergyman, was born at Aldwinkle in Northamptonfhire, in 1608. He made, under the inftructions of the father, fo rapid a progrefs, that at twelve years of age he was deemed fitted for the

ſtudies of an univerſity. He was accordingly ſent to Queen's college, where he applied himſelf with ſo much ardour and ſucceſs that he took his degrees with great applauſe in the years 1624 and 1628. He removed from Queen's to Sidney college, and was choſen miniſter of St. Bennet's pariſh, in the town of Cambridge. In 1631, he obtained a fellowſhip in Sidney college, and was almoſt at the ſame time collated to a prebend in the cathedral church of Saliſbury. Soon after this he was ordained prieſt, and preſented to the rectory of Broad Windſor in Dorſetſhire. In the year 1641, the nation being threatened by a civil war, Mr. Fuller, for the ſake of greater ſecurity, and in the expectation of better opportunities for his ſtudies, and a more ready acceſs to books, removed to London, where he acquired high reputation as a popular preacher, and was choſen lecturer of the Savoy in the Strand. Mr. Fuller was a member of the convocation, but diſapproved and reſiſted ſome of its meaſures which he thought to be of very dangerous conſequence. He was, nevertheleſs, zealouſly attached to the king, and by his open avowal in defence of the royal party, he was brought into danger with the parliament, who, in the end, deprived him of all means of ſubſiſtence, and of a church to preach in. He now engaged as chaplain to ſir Ralph Hopton, the duties of which office he conſtantly exerciſed as the army moved from place to place, omitting, however, no opportunity, as occaſions might occur, of purſuing his favourite ſtudies, and of making hiſtorical collections for his work, well known by the title of the "Worthies of England." Mr. Fuller, in ſeveral inſtances, was uſeful in animating the troops in defence of the cauſe for which they were contending. In the year 1643, he was appointed chaplain to the infant princeſs Henrietta Maria, who reſided at Exeter, and here he remained till that city ſurrendered in 1646, to the parliament forces, when he was permitted, without any reſtrictions, to remove to London. He was now choſen lecturer at Clement's Lane, in Lombard Street, whence he ſoon removed to St. Bride's church, Fleet Street. Some offence being taken, he was for a ſhort time ſuſpended from the functions of a preacher, but in 1648, he was allowed to proceed in his duty, and was preſented to the living of Waltham Abbey, Eſſex. Mr. Fuller ſpent that, and the following year, between the metropolis and Waltham, employing engravers to embelliſh with maps and other copper plate engravings his view of the Holy Land, entitled, "A Piſgah ſight of Paleſtine, and the Confines thereof, with the Hiſtory of the Old and New Teſtament acted thereon." This was publiſhed in folio in the year 1650, and in the following year he laid before the public a collection of lives, ſome written by himſelf, and ſome by others, of religious reformers, martyrs, &c. under the title of "Abel Redivivus." In 1656, he publiſhed his "Church Hiſtory of Britain from the Birth of Chriſt to the year 1648:" "The Hiſtory of the Univerſity of Cambridge ſince the Conqueſt;" and "The Hiſtory of Waltham Abbey." About the year 1659 or 1660, Mr. Fuller was invited to another living in Eſſex, where he exerciſed his miniſterial labours till he was appointed chaplain to lord Berkeley, who preſented him with the living of Cranford, in Middleſex. He afterwards went with his lordſhip to the Hague, to congratulate Charles II. on his reſtoration. He was now appointed chaplain to his majeſty, created doctor of divinity at Cambridge, and was in a fair road to a biſhopric, but taking a journey to Saliſbury, on the buſineſs of his prebend, he was attacked with a fever which put an end to his life in the year 1661. The laſt literary work on which his attention was employed was his "Hiſtory of the Worthies of England," part of which was printed during his life, and the reſt from his papers after his death. It was publiſhed in 1662, in folio. Beſides the works already mentioned, he was author of many others of which we may notice "David's hainous ſin, heærtie Repentance, and heævie Puniſhment," in 8vo., and a "Hiſtory of the Holy War," which laſt went through ſeveral editions. He printed likewiſe a ſermon which was preached at Weſtminſter abbey on occaſion of the king's commencing hoſtilities againſt his parliament, from the words "Yea let them take all, ſo that my Lord the King return in Peace." The funeral of this worthy man was performed by the direction and at the expence of lord Berkeley, and it was attended by two hundred of the clergy. Mr. Fuller had a very remarkable memory; he could repeat five hundred ſtrange and unconnected words after twice hearing them; and a ſermon, verbatim, after he had heard it once; he undertook, after paſſing from Temple Bar to the fartheſt part of Cheapſide and back again, to mention all the ſigns then over the ſhops, as they ſtood in order, on both ſides of the ſtreets repeating them backwards and forwards, and performed the taſk with great exactneſs. He had a great vein of wit, which is thought to have injured his writings; they nevertheleſs are repoſitories of much valuable and uſeful information. Biog. Brit.

FULLERS' *Earth*, in *Mineralogy*, *Argilla Smectis*, Waller; *Talcum fullonum*, Wern.; *Talcum Smectis*, Linn.; *Fullonia communis*, Forſt.; *Argille Smectite*, Haüy; *Terre à foulon*, Fr.; *Walker-Erde*, Germ.; *Walk-lera*, Swed.; a ſpecies of earth, which from the predominance of ſilex as a conſtituent part, (at leaſt in the varieties analyzed by Bergmann and Klaproth,) ſhould be referred to the ſiliceous genus, though Werner, guided by what he terms the characteriſtic component part, places it in the firſt diviſion of his talc genus, together with bole, native talc earth, and écume de mer. Emmerling places it in his flint genus, in the ſame manner as all the varieties of common clay are transferred by him to that genus. It is fruitleſs to enter on any diſcuſſion with regard to the place a foſſil is to occupy in a ſyſtem, before all its relations, oryctognoſtical, chemical, and geological, are thoroughly underſtood; and this is more than at preſent can be ſaid of fullers' earth, which, in common with other mineral ſubſtances, denominated from the particular uſes to which they may be applied, is, both by collectors and writers, continually confounded with other ſubſtances, eſpecially with varieties of common clay. Hence it is that we find ſo very contradictory deſcriptions of the characters of this earth. The following external characters are principally derived from the varieties found in England, in Saxony, (particularly at Roſſwein, at the foot of the Saxon Ertzgebirge) in Auſtria, Moravia, the Palatinate, Alſace, and Sileſia. Many of thoſe from other parts of Europe that we have had an opportunity of ſeeing in collections, appeared to partake too much of the nature of common clay, others of that of ſteatite, while others again exhibited characters belonging to varieties of marle.

Fullers' earth is generally of a greeniſh colour, more or leſs mixed with brown and grey, together with a portion of yellow, by which various ſhades of dirty olive green are produced; ſometimes the yellow predominates, and a yellowiſh grey appears, paſſing over (in the genuine *Lemnian earth*, which, as we ſhall ſhew hereafter, cannot be ſeparated from fullers' earth,) into whitiſh grey. It is alſo found of various ſhades of red: that of Sileſia is tile red, ſometimes ſprinkled with white and green ſpots. Often ſeveral of the juſt mentioned colours are intimately, but mechanically, mixed; which, in ſome, can be obſerved only with the aſſiſtance of a magnifying glaſs. The brown colour, both uniform and in ſpots, is generally owing to an accidental admixture of iron ochre.

It

It has been found maffive only, fometimes conftituting whole fletz-ftrata. Large maffes, on being feparated, generally difunite into fmaller pieces, when expofed to the influence of the atmofphere.

Internally it is more or lefs dull; its fracture being earthy, generally of a fine grain: often it appears perfectly conchoidal, and even flaty; but commonly the fragments are indeterminately angular and blunt-edged, and in the latter cafe perfectly opaque: in the pureft varieties the edges are fometimes tranflucent. When fcratched with the nail of the finger, or cut with a knife, it becomes fmooth and fhining.

It is very foft, almoft friable, and mild; feels more or lefs greafy, and fcarcely adheres to the tongue. It does not foil. Specific gravity about 2.

Genuine fullers' earth does not effervefce with nitrous acid; nor are all varieties of it inftantly reduced into powder by that acid. But fmall pieces put into water almoft inftantly crumble into conical heaps of minute, very foft particles, without producing a crackling noife, as is the cafe with bole; neither does a foaming take place, as has been copied by moft authors from Cronftedt, who attributes this quality to a fullers' earth found at Ofmund in Dalarne.

Though fufible *per fe*, it requires a high degree of heat: that of Hampfhire, according to Klaproth, melted in the charcoal crucible into a denfe, dark-grey, opaque flag, which had loft 0.25 of its original weight, and contained many grains of iron. In the clay crucible the fame was reduced to a clofe, blackifh, green flag, with foft, reddifh, punctated furface. Mr. Brongniart fays, that of Woburn melted into a flaggy mafs at 120° of Wedgewood's pyrometer. The variegated kind of fullers' earth (according to the late Mr. Wiedenmann's experiments,) acquired before the blow-pipe a grey, or greyifh black colour; and a whitifh variety, thus acted upon, became ftill whiter: but neither of them manifefted any figns of fufion, except at the fharp edges of the fragments. The fame appears to hold good with all genuine varieties of this mineral fubftance; whence the obfervation of the late Mr. Fichtel, that the true fullers' earth "melts with great eafe before the blow-pipe, often with ebullition and increafe of its bulk," is undoubtedly founded in error.

Bergmann was the firft who analyzed what he ftyles fullers' earth, from Hampfhire; and all fubfequent mineralogical writers have followed him in mentioning that part of England as producing the fubftance in queftion: it is, however, probable that the accurate Swedifh chemift was mifinformed as to the county; though, from the fatisfactory defcription he gives of its external characters, it is fufficiently evident that he operated on an Englifh fullers' earth. The refults of his analyfis were

Silica - - -	51.80
Alumine - - -	25.00
Lime - - -	3.30
Magnefia - -	0.70
Oxyd of iron - -	3.70
Water - - -	15.50.

The variety lately analyzed by Klaproth, which is well afcertained to be from Ryegate, was found to be compofed of

Silica - - -	53
Alumine - - -	10
Oxyd of iron - -	9.75
Magnefia - -	1.25
Lime - - -	0.50
Muriate of foda -	0.10
Water, &c. - -	24
Kali (a trace only)	
	98.60. Klap. Beitr. vol. iv.

We are indebted to the fame celebrated chemift for an analyfis of a Silefian fullers' earth, the external characters of which agree pretty well with thofe of the other varieties, except that its colour is tile-red, like fome varieties of bole, either pure, or fpotted and veined with white and green; which colours, before the blow-pipe, give way to a marbled brown. Hundred parts of it contain

Silica - - -	48.50
Alumine - - -	15.50
Magnefia - -	1.50
Oxyd of iron - -	6.50
Oxyd of Manganefe -	0.50
Water, &c. - -	25.50
Muriate of foda, (a trace only)	
	98. Klap. Beitr. vol. iv.

We mentioned above the *Lemnian earth* as a variety of the common fullers' earth; but it fhould be underftood that three diftinct fubftances were comprized by the ancients under the name of Terra Lemnia. "Tres ejus," fays Galen, "fignantur differentiæ; *una* quam pofuimus terræ facræ, quam alii nemini, præter unam facerdotem, contingere fas eft; *altera* vero ejus quæ revera Miltos eft five Rubrica: utuntur autem ea potiffimum fabri: demum *tertia* ejus extergit; qua utuntur qui lintea et veftes lavant, quibus utique collibitum eft." The nature of the three kinds of earth alluded to in this paffage has been placed in a clearer light by Klaproth. The *fecond* of them, called Miltos, was a red earth applied for the purpofe of painting. The *third* appears to be the fame which is mentioned by Pliny under the name of *Cimolia*, as an excellent fubftance for fulling: but it contains no magnefia. (See CIMOLIA.) But the *firft* of the varieties enumerated by Galen, is the true *terra figillata*, recommended as early as the time of Homer for the cure of infectious difeafes, and ftill celebrated in the eaft for its imputed medicinal virtues. At the time of Diofcorides it was mixed by the priefts with goats' blood, and marked with a ftamp reprefenting that animal (Σφραγὶς αἰγὸς): and ftill at the prefent day this fubftance is dug up in the ifland of Lemnos (now Stalimene,) once a year, namely, the 15th of Auguft, the day on which the Greeks celebrate the feftival of the afcenfion of the Virgin; the clergy and magiftrates, after feveral previous religious ceremonies, fuperintend the excavation of this fubftance, which is immediately formed into fpindle-fhaped balls of one ounce in weight, and marked with a feal bearing the name of the earth in the Turkifh language. This fubftance (which fhould not be confounded with a kind of bole of the fame name, which is generally found nidulating in bafalt and bafaltic wackes) is of a whitifh-grey colour, with ferruginous fpots on its fmooth furfaces. Put into water, it emits air, and foon crumbles into a loofe heap, exactly like the common fullers' earth, to which, notwithftanding the flight difference in the refults of the analyfis, it may, according to Klaproth's opinion, be confidered as fubordinate. The genuine Lemnian earth contains in hundred parts

Silica - - -	66.
Alumine - - -	14.50
Oxyd of iron - -	6.
Lime - - -	0.25
Magnefia - - -	0.25
Natron - - -	3.50
Water - - -	8.50
	99. Klap. Beitr. vol. iv.

The

The beft fullers' earth is found in England, efpecially Buckinghamfhire, Bedfordfhire, Surry, Kent and Nottinghamfhire. The following localities are likewife mentioned in the different fyftems of mineralogy; but we cannot vouch for the correctnefs of all of them, fince many fubftances have been called by the name of fullers' earth, that, fyftematically fpeaking, appear to have no claims to it. Auftria (Karlftein, Görtz); Croatia (Bellowar); France (Rittenau, Winterhaufen, in Alface, &c.); Hungary (Fünfkirchen, &c.); Moravia; Neumark (Zillenzi, Droffen); Palatinate (Kleinftärz); Pomerania (Stargard); Saxony (Roffwein, Johan-Georgenftadt, Schönberg); Silefia (Riegerfdorf, Nimptfch); Sweden (Ofmundberg); Stiria (Cilly and Thalberg); Switzerland (territory of Zurich and Berne); Tranfylvania (Thorotfko); Wirtemberg (Seeburg), &c.

The geognoftic relations of fullers' earth are not yet fufficiently afcertained to enable the geologift to derive any general refults from them. The relative age of the different formations appears to be as little underftood, as the mode in which they have originated

In Saxony, where it is found in extenfive beds, it appears to owe its origin to the difintegration of rocks of the primitive trap formation of Werner; that of Roffwein is fubordinate to green ftone flate. In the Upper Palatinate it alternates with layers of clay and porcelain earth. In England it occurs principally in beds, and in ftrata alternating with or refting on fand-ftone, the geognoftic relation of which is not yet determined. At Wavedon in Buckinghamfhire, on the borders of Bedfordfhire, where the pureft fort is found, it appears to occur in the newer fletz-formation, fubordinate to fand-ftone. From the furface of the earth, to the depth of fix feet, feveral layers of fand are feen of various fhades of reddifh, under which there is a thin ftratum of fand-ftone which refts on the fullers' earth. The upper part of this latter, which is in contact, and mixed with the fuperincumbent indurated fand, is called *cledge* by the workmen, and thrown away as ufelefs. To this fucceeds a ftratum of the good fullers' earth, being about eight feet thick, and fubdivided by horizontal rifts into other layers of nearly one foot and a half in thicknefs. There is generally a ferruginous fubftance depofited on the rifts, which penetrates part of the layers; and the earth, fo tinged, is called *crop* by the workmen, while the part unimpregnated by it receives the name of *wall-earth*. Under the fullers' earth is a ftratum of coarfe white fand-ftone of about two feet thicknefs. The Englifh fullers' earth is of much newer formation than that of Saxony; as is that of Moravia, which appears to belong to the alluvial formation.

The principal ufe to which fullers' earth is applied is indicated by its name, (fee art. FULLING.) The quality it poffeffes, of depriving cloths and other ftuffs of the greafe and oil ufed in their preparation, appears to be derived more from the argillaceous than the other ingredients; and Mr. Kirwan thinks that the union of the lime and magnefia (which in Bergmann's opinion is chemically combined with the alumine, and not mechanically mixed, as in marls) is ufeful only as contributing to the prompt diffufibility of this earth, which particularly qualifies it for the purpofe to which it is applied Every clay that has fome unctuofity, (which manifefts itfelf by the polifh it receives by being rubbed with the nail,) and the filiceous ingredients of which are very fine, may be ufed for fulling; but it does not follow that all fuch clayey earths as agree in thefe two characters, and in the economical advantage derived from them, fhould of courfe occupy the fame place in the fyftem. Fullers' earth was formerly an article of the greateft importance in England, whence its exportation was prohibited under fevere penalties; but of late it has been fuperfeded by other fubftances, particularly foap.—K.

We fubjoin fome obfervations on the fubject of fullers' earth, communicated by Mr. Farey.

"This mineral is found in three places at leaft in the Britifh feries of ftrata, the uppermoft of which is, in the fand ftrata that underlay the chalk, and are expofed to view by the great Kent, Suffex, and Surry *denudation*, (fee that article,) at the foot or fouthern fkirt of the North Downs, at various places near Ryegate, Godftone, &c. and from whence London is principally fupplied with the article, though the quality of the earth and thicknefs of the feam (which varies much in different places) is greatly inferior to the next fullers' earth ftratum, found near the lower part of the great ferruginous fand ftrata, (which Mr. Smith has denominated the Woburn fand,) in which fullers' earth is now dug in the greateft perfection, at Hogftye-end in the parifh of Waverdon, Bucks, near Woburn. Formerly it was dug alfo in Afpley Guife parifh, in Bedfordfhire adjoining, but the works there are difcontinued. Below this ftratum of fullers' earth, which fometimes proves of feven feet in thicknefs for fome diftances together, is a fingular greenifh chertz ftone, with a rhomboidal fracture, which feems very characteriftic of this ftratum. In diftant counties, like Lincolnfhire, wherein we have examined it, about Bolingbroke, and to the N. and N. W. of that place, we find this and the accompanying ftrata very fimilar to thofe of Bedfordfhire, although the fullers' earth is here fo thin and imperfect in its quality, as not to be known by that name, but rather as a clay feam which holds up their fprings of water in the fand diftrict. It may alfo be worthy of remark refpecting this fullers' earth ftratum, that petrified or filiceous wood occurs in the ferruginous fand and fand-ftone below it in great plenty and perfection, and furnifhes moft of the perfect fpecimens of this kind from Afpley, Crawley, and other places near Woburn, which are to be met with in the cabinets of the curious. How the ftories of the petrifying fprings at Afpley which occafioned them, as it is faid, came firft into circulation, we are unable to trace; but certain it is, that the inhabitants of this village difclaim any knowledge of fuch fprings or petrifying waters, except what books and credulous travellers have brought to them. It has often occurred to the writer of this, that there might, at fome period of the earth's formation and confolidation, have been a connection between the *filex* which abounds in fuch quantity and fo very minute a ftate of divifion in the fullers' earth, and that which has fo perfectly taken the place of the pieces of wood, lodged in the fand below it, and perhaps filled the interftices of the chertz fand-ftone above mentioned; but that fuch took effect, in too gradual a manner to be ever noticed as a petrifying fpring on the furface, as the ftories above mentioned have maintained. The examination of fome hundreds of fpecimens of this petrified wood in Afpley and Crawley, fome many feet in length, and a foot or more in diameter, has not feemed to furnifh data for referring any of them to the known woods of the prefent race, or to contradict the theory advanced in our article COLLIERY, of fuch being part of the arboriferous trunks of fub-aqueous vegetables of the primitive creation, whofe *reliquia* they are, and by which alone their exiftence can ever be known to us, and not fragments of any of the trees which, now, or at any period, did occupy or grow upon the *dry land* of our globe.

"In Somerfetfhire and other counties, a ftratum occurs between the rocks of the Bath free-ftone ftrata, which is there called fullers' earth, and poffeffes its fcouring properties; as

as indeed other ſtrata do which are not called fullers' earth, particularly one in the aſſemblage of ſtrata below the chalk, called the chalk-marl; from which a ſaponaceous whitiſh clay is got, and uſed by the country people for extracting greaſe, ſcouring greaſy kettles, &c. There are doubtleſs other ſtrata in the Britiſh ſeries which poſſeſs theſe properties, in a greater or leſſer degree, but the modern improvements in chemiſtry and the arts have rendered fullers' earth, of even the beſt quality, of comparatively ſmall importance, to that which it had when particular ſtatutes were judged neceſſary for prohibiting its exportation, under the ſevereſt penalties.

"Fullers' earth has been deemed abſolutely neceſſary to the well dreſſing of cloth; and hence foreigners, though they can procure wool to be clandeſtinely exported out of the kingdom, can never reach to the perfection of the Engliſh cloths, &c. without fullers' earth, which is very plentiful in England, and excels that of other countries in quality, as much as in quantity and cheapneſs. For this reaſon it is made a contraband commodity; and the export made equally criminal with that of exporting wool."

This earth is reckoned by ſir H. Plat, and others, a great improver of land; and conſequently proper for being uſed as a manure where it is found in ſufficient quantity for that application. It is probably the moſt adapted to the more light ſorts of land.

FULLER'S *Thiſtle*, in *Agriculture*, the common name of a plant cultivated in the field in ſome diſtricts, for its uſe by the manufacturers of ſome ſorts of cloth, as affording a fine vegetable hook, &c. See TEASLE.

FULLERTOL, in *Geography*, a town of Hindooſtan, in Rohilcund; 20 miles E.S.E. of Pillibeat.

FULLERTON, CAPE, a cape in Hudſon's bay. N. lat. 64 10. W. long. 88° 20'.

FULLERTON *Point*, a cape on the W. coaſt of the iſland of Antigua. N. lat. 17 13'. W. long. 61° 35'.

FULLERY, a work-houſe, or place where cloths, &c. are fulled or ſcoured. The term is principally underſtood of the fulling-mill.

FULLING, the art or act of cleanſing, ſcouring, and preſſing cloths, ſtuffs, and ſtockings, to render them ſtronger, cloſer, and firmer; called alſo *milling*. See BLEACHING.

Pliny, lib. vii. cap. 56. aſſures us, that one Nicias, the ſon of Hermias, was the firſt inventor of the art of fulling: and it appears by an inſcription quoted by ſir G. Wheeler, in his travels through Greece, that this ſame Nicias was a governor in Greece in the time of the Romans.

The fulling of cloths, and other ſtuffs, is performed by a kind of water-mill; thence called a *fulling or ſcouring-mill.*

Theſe mills, excepting in what relates to the mill-ſtones and hopper, are much the ſame with corn-mills. And there are even ſome which ſerve indifferently for both purpoſes; corn being ground, and cloths fulled, by the motion of the ſame wheel.

Hence in ſome places, particularly France, the fullers are called *millers;* as grinding corn, and milling ſtuffs, at the ſame time.

FULLING *Mill*, in the *Manufactures*, is a machine employed for waſhing, ſcouring, or fulling of cloth, either with a view of cleanſing it, in which caſe it is termed ſcouring, or for the purpoſe of thickening woollen cloth, worſteds, &c. when it is termed milling; in either caſe the fulling-mill employed is the ſame: its operation is to conſtantly agitate and expoſe a new ſurface to the action of water or other menſtrua, with which the goods to be operated upon are conſtantly ſupplied; this is performed by two beaters or mallets, which are ſucceſſively raiſed by the action of a water-mill, or ſteam-engine, and let fall upon the cloth, which they ſtrike and turn over in the trough where it is placed; a conſtant ſtream of water paſſing through it, carries away the dirt and impurities which are looſened from the cloths by the agitation of the mallets, or ſtocks, as they are termed.

An inſpection of *Plate* XXIX. *Mechanics*, will give a clearer idea of the conſtruction of this machine. Here *fig.* 4. is a perſpective view of a pair of ſtocks, or fulling-mill, in the action of ſcouring a piece of goods; the other figures are explanations of the parts of the machine by a ſection, *fig.* 5, and elevation, *fig.* 6. A fulling-mill generally contains four, ſix, eight, or ten pair of ſtocks, according to the quantity of work it is required to perform; theſe are all moved by the ſame water-wheel, or ſteam-engine: in the former caſe, the axis of the water-wheel is employed to move two or three pair, whilſt the others receive their motion from one of two ſimilar and parallel ſhafts, turned by cog-wheels from the ſhaft of the water-wheel. A portion of this ſhaft is repreſented at A in the plate, beneath the floor of the mill; and the cog, which gives it motion, is denoted by N, *fig.* 4: it revolves upon gudgeons at its ends, which are ſupported on braſſes reſting on the frame work or maſonry, as ſhewn in *fig.* 6. Four levers or lifters, B, B, D, D, are fitted upon the ſhaft which alternately, as they paſs the beaters E and F, lift them up, and they deſcend by their own gravity: theſe beaters are formed from a large block of wood E and F, affixed to a long ſtem G, moving on a centre at *g*, which is ſupported at the top of the frame H I K of the whole machine; the principal part of this is a large block of wood H I, hollowed out into a large cavity *a a*, for the reception of the cloth; this is termed the trough. K are pieces of wood fixed to the piece H I, and curved to a ſegment of a circle ſtruck from the centre *g*, on which the beaters move; in the ſpaces between theſe beams the ſtems G of the beaters project ſo as to be intercepted by the lifters B, D, as they revolve; the beaters are alſo curved at the loweſt ſide to the ſame circle as the beams K, ſo that they apply as cloſe as poſſible to each other without touching; this is neceſſary to prevent the cloth getting between them, and being pinched or cut thereby. The ends of the beaters, which act upon the cloth, are armed with three ſmall boards at *h*, *i*, and *k*, *fig.* 5. which project like teeth, and act more effectually to bend and diſturb every portion of the cloth placed in the trough *a a*. The beaters act very cloſe to each other ſideways, that the cloth may not introduce itſelf between them; and in the ſame manner they fit the ſides of the trough, formed by boards nailed to the block H I, and the beams K, which alſo give a great ſtrength to the machine. At one ſide theſe boards are not ſo high, for the convenience of taking the cloth out of the trough; but when the machine is in action a moveable board M, *fig.* 4. is placed on the top of the loweſt ſide, to raiſe it to the ſame height with the other, and prevent any danger of the cloth getting over. R is a pipe bringing water to the trough, and furniſhed with a ſtop cock to regulate the ſupply; the pipe paſſes through the back of the block H I, and the water ſtriking againſt a board *x*, placed before the aperture, it falls down in a ſheet upon the cloth, and keeps it conſtantly ſaturated. When the cloth is to be put into the machine, a workman with a lever ſupported on an iron hook *k* receives the beater when at the higheſt point of its motion, and prevents its deſcent; he then thruſts a long iron bolt *r*, *fig.* 6. through a hole in the beams K, and by that means retains it; the other beater is then taken up in the ſame manner, and retained

tained by the same bolt, being pushed farther forwards; the loose board M is now removed, and the cloth thrown into the trough *a a*; the beaters are then set in motion by removing the bolt *r*, which held them up. As the shaft A revolves, the lifters alternately engage one or other of the beaters which falls against the cloth, and, striking it at the under side, thrusts it up into the curved part of the trough *a a*, and by that means it falls down upon the head of the beater; when the lifter raises the beater another time, the cloth falls into the space left by its being raised; in this manner it continues turning the cloth over in the trough, and striking it by its teeth *h, i, k*, so as to wash it thoroughly. As the two beaters fall alternately, that is, one is up when the other is down, the cloth is also turned round diagonally in the trough: by this means, after milling a piece of cloth for some hours, there is little chance but that every part shall be subjected to the action of the beaters, though a whole piece is in action at once, and consequently folded in innumerable creases. The water which enters at the upper end of the trough beneath the loose board *x*, (which is intended to spread the water out into a thin sheet, that it may fall equally upon the whole of the cloth,) escapes slowly through the grooves between the beam K, in which the stems G move, carrying with it all the filth contained in the cloth; it falls into a pit represented by the dark space in *figs.* 5. and 6, in which the shaft revolves. This pit usually has a communication with the water of the mill, to wash away the sediment which accumulates in the pit, from the foul water continually falling into it. The machine is fixed over this pit by a tennant at the lower part of the block H I, which is bolted between two beams L, L, supported on masonry; M are two braces to sustain the ends of the beams K, and keep the whole machine firmly in the same position: the beams L, L, are extended to a considerable length, and have three or four machines placed parallel to each other between them.

The true method of fulling with soap is delivered by Monf. Colmet in an authentic memoir on that subject, supported by experiments made by order of the marquis de Louvois, then superintendant of the arts and manufactories of France. The substance of which we shall here subjoin.

FULLING, *Cloth and woollen Stuffs, with Soap, Method of.* A coloured piece of cloth, about forty-five ells, is to be laid in the usual manner, in the trough of a fulling-mill, without first soaking it in water, as is commonly practised in many places.

To full this trough of cloth, fifteen pounds of soap are required; one half of which is to be dissolved in two pails of river or spring-water, made as hot as the hand can well bear it. This solution is to be poured by little and little upon the cloth, in proportion as it is laid in the trough: and thus it is to be fulled for at least two hours; after which it is to be taken out, and stretched.

This done, the cloth is immediately returned into the same trough, without any fresh soap; and there *fulled* two hours more. Then taking it out, they wring it well, to express all the grease and filth.

After the second fulling, the remainder of the soap is melted, as the former, and cast, at four different times, on the cloth; remembering to take out the cloth every two hours, to stretch it, and undo the plaits and wrinkles which it has acquired in the trough. When they perceive it sufficiently fulled, and brought to the quality and thickness required, they scour it out for the last time in hot water, keeping it in the trough till it be quite clean.

As to white cloths; because these full more easily, and in less time, than coloured ones, a third part of the soap may be spared.

FULLING *of Stockings, Caps, &c.* may be performed somewhat differently; viz. either with the feet or the hands; on a kind of rack, or wooden machine, either armed with teeth of the same matter, or else with horses or bullocks' teeth.

The ingredients made use of herein are urine, green soap, white soap, and fullers'-earth. But water softened with chalk is far preferable.

Note, woven stockings, &c. should be fulled with soap alone; for those that are knit, fullers'-earth may be used with the soap.

Indeed, it is frequent to full these kinds of works with the mill, after the usual manner of cloths, &c. But that is too coarse and violent a manner, and is apt to damage the work, unless it be very strong.

FULLING, in the *Manufacture of Hats*, is the completion of *felting* (which see), and has for its objects the intimate connection of the fibres, and a more perfect and durable cohesion of the whole mass. For this purpose the mere mechanical act of pressure is insufficient. In this way the result would be a formless mass, without consistence. Experience (says Chaussier, cited in Nicholson's Journal, vol. i.) has long shewn, that for the fulling it is necessary to make use of a bath of water heated nearly to ebullition, into which are put 10 or 15 pounds of lees of wine, for each hundred pounds of water. The heat is kept up during the whole time of working, and every three or four hours a new quantity of lees is added. Into this bath the workmen plunge their felt, and begin their second process. The felt is dipped in, and immediately again taken out and squeezed, bended and rolled, by pressure in different directions, sometimes with the hand defended by leather, and sometimes by means of a roller or other similar instrument. The immersion and working of the felt are repeated, and the operation continued, till the stuff is well condensed, and has acquired the requisite solidity.

Since the operation of fulling is employed to form a dense and compact stuff with the fibres or hairs, and to determine the intimate cohesion of its component parts; and since the mere mechanical operation is not sufficient for this purpose, even with the assistance of a water-bath at the boiling heat, without the addition of lees as a necessary condition;—this last must be considered as a chemical solvent, which acts directly on the substance of the hairs themselves, and produces, either by softening or swelling them, an alteration necessary to insure the cohesion of the different fibres of the stuff. But the lees being composed of the mucilaginous and colouring parts, which are separated, together with a great quantity of tartar, or the acidulous tartrite of pot-ash, it became necessary to ascertain, in a positive manner, what might be the principle of its action. The editor of the Encyclopedié affirms without hesitation, that it is the alkali or pot-ash of the lees which determines the fulling. But in order to shew (says Mr. C.) how erroneous this assertion is, nothing more is necessary than to dip a piece of blue paper into the bath, by which the former becomes instantly red; and if, after several hours' work, the state of the bath be again examined, it is found that the acidulous tartrite of pot-ash is partly exhausted, and the workmen soon perceive, from the difficulty of continuing their work, that a new quantity is required to be added. And again, if we consider the sparing solubility of the acidulous tartrite of pot-ash in cold water, it is easily seen why in this process the water must be kept nearly boiling. Whence

 it

it is evident that it muſt act by the portion of acidate which it contains. Hence our author was induced to think, that the ſulphuric acid might be advantageouſly ſubſtituted in the place of the lees; and as 12 pounds of lees are uſually added to 100 of water, he eſtimated by approximation that one gros of ſulphuric acid would be equivalent to at leaſt one pound of the lees, and conſequently that 12 gros of ſulphuric acid would be ſufficient for 100 pounds of water. His conjectures were ſoon confirmed by experiment; and after a fair trial it was aſcertained that the uſe of the ſulphuric acid is much preferable to that of wine-lees; that it is not only much more economical, but ſtill more convenient in the uſe; and, what is yet more important, the health of the workmen is not injured by the exceſs and duration of the heat, the thick vapours, and the diſguſting odour, which exhales from the bath, particularly when the lees have been altered by mouldineſs and putrefaction, which is very common in theſe manufactories. When the ſulphuric acid is employed, it is uſeleſs to keep the bath nearly boiling, as was formerly done. A degree of heat of 25 or 30 degrees (90° or 100 of Fahrenheit) is ſufficient for good fulling. The ſaving of fuel is an object of importance in manufactories; and as very little fire is neceſſary when ſulphuric acid is uſed, cauldrons of lead may be ſubſtituted inſtead of copper-boilers, the firſt coſt and annual repair of which are very conſiderable.

The felts prepared by this new proceſs are alſo of a very ſuperior quality to thoſe which have been worked in the bath with wine-lees. In fact, the mucilaginous and colouring matters of the lees, which are ſuſpended in the bath, penetrate the texture of the ſtuff, and adhere with more or leſs force; and when, after having paſſed the hats through the dye, they are beaten, a fine black duſt flies off in great abundance, which not only weakens the texture of the felt, but by diffuſing itſelf through the manufactory greatly incommodes the workmen, and frequently occaſions coughs and diſorders of the throat.

Hats felted in this manner, ſays a manufacturer who had adopted this proceſs, are not only clear of the powder which abounds in the others, but they take the dye better, and are cleaner.

FULLONIANI, in *Church Hiſtory*, heretics who anathematized all who did not acknowledge, that Chriſt ſuffered in his divine nature; or who diſtinguiſhed his human and paſſible nature from his divine and impaſſible.

FULLONICA *Terra Alba*, white fullers' earth, in natural hiſtory, a name given by ſome authors to the common white tobacco-pipe clay. See CIMOLIA, and PIPE-CLAY.

FULLONUM CARDUUS. See TEAZEL.

FULMAR, in *Ornithology*, a ſpecies of procellaria, or petrel, (the PROCELLARIA GLACIALIS, which ſee,) that inhabits the iſle of St. Kilda; appearing there in November and continuing through the whole year, except the months of September and October. It lays a large white and brittle egg, which is hatched in June. This bird is ſuperior in ſize to the common gull; the bill is ſtrong, hooked at the end, and of a yellow colour. The noſtrils are compoſed of two large tubes, lodged in one ſheath; the head, neck, inferior part of the body, and tail are white; the back and coverts of the wings aſh-coloured; the quill-feathers duſky, and the legs yellowiſh. Inſtead of a back toe, it has only a ſort of ſpur, or ſharp ſtraight nail. The ood of theſe birds is the blubber or fat of whales, of which they are very voracious; inſomuch that the whales are diſcovered at ſea by the flights of theſe birds; this is ſoon converted into oil and ſpouted from their bills in large quantities for their defence, and for the ſupply of their young. This oil, it is ſaid, has been ſucceſsfully uſed in rheumatic caſes. The fulmar is of ſingular uſe to the iſlanders, as it ſupplies them with oil for their lamps, down for their beds, a delicacy for their tables, a balm for their wounds, and a medicine for their diſeaſes. The fulmar is alſo a certain prognoſticator of the change of the wind; becauſe, if it comes to land, no weſt wind is expected for ſome time; and the contrary, when it returns and keeps at ſea. Pennant.

FULMINANT, FULMINANS, or *Fulminating*, an epithet applied to ſomething that thunders, or makes a noiſe like that of thunder.

We ſay, "Jupiter fulminans, aurum fulminans, pulvis fulminans, &c." The Jupiter fulminans and the Jupiter fulgurator ſeem to have been very much of the ſame kind: but if they are diſtinguiſhed, we may conſider the former as the diſpenſer of the lightnings which are darted from the clouds, and the latter as the diſpenſer of thoſe leſſer lightnings that only ſhoot about and ſtruggle amidſt the clouds.

FULMINANS, *Aurum*. See AURUM.

FULMINANS, *Pulvis*, is a compoſition of three parts of nitre, two parts of purified pearl-aſh, (kali præparatum, Lond. Pharm.), and one part of flowers of ſulphur. The parts are to be well mixed in an earthen mortar, and placed on a tile or plate before the fire, till it is perfectly dry; and if it be transferred, while hot, into a bottle with a ground ſtopper, it may be kept for any time without injury. Its effects are exhibited by pouring from 10 to 40 grains into an iron ladle, placed over a ſlow fire, in which caſe it will ſoon acquire a brown colour, and the conſiſtence of paſte; a blue lambent flame will appear on its ſurface; and immediately afterwards, the whole compoſition will explode with a ſlight momentary flaſh, and a loud noiſe. The maſs being removed from the fire as ſoon as it is fuſed, may be kept in a dry, well cloſed phial, and it will at any time be exploded by a ſpark, and burn like gun-powder, but more rapidly and with a greater detonation; but this effect cannot be produced on the unmelted powder, however accurately its ingredients may have been mixed. Whilſt the powder is in fuſion, but not ſufficiently heated to produce the blue flame, a particle of ignited charcoal thrown upon it, will immediately occaſion a very loud exploſion. The fulminating property of this powder is acquired by fuſion, or when the pot-aſh and ſulphur form ſulphuret of pot-aſh. It may therefore be prepared by mixing ſulphuret of pot-aſh with nitre, inſtead of adding the ſulphur and alkali ſeparate.

FULMINATING DAMP. See DAMP.

FULMINATING *Legion*. See THUNDERING *Legion*.

FULMINATION, in the *Romiſh Canon Law*, a ſentence of a biſhop, official, or other eccleſiaſtic appointed by the pope; whereby it is decreed, that ſome bull, diſpenſation, or reſcript, ſent from the pope, ſhall be executed.

Fulmination is the ſame thing with the verification, or recognition, of a letter, or inſtrument, of a prince in a lay court.

FULMINATION is alſo uſed for the denunciation or execution of a ſentence of anathema, made in public, with due ſolemnity. See ANATHEMA.

In fulminating anathemas, the biſhop who pronounces ſentence is to be clothed in his epiſcopalia, and accompanied with two prieſts, in ſurplices; after ſentence is pronounced,

nounced, they caſt down to the ground the lighted wax-tapers which they held in their hands.

FULMINATION, or *Fulguration*, in *Chemiſtry*, a vehement noiſe, or ſhock reſembling thunder, occaſioned by the ſudden exploſion and inflammation of divers preparations; as *aurum fulminans*, &c. when ſet on fire.

FULNECK, in *Geography*, a village ſituated at a ſmall diſtance from the high road, leading from Leeds to Bradford, 4½ miles from the former place, in the wapentake of Morley, and in the weſt-riding of the county of York, is remarkable for a ſettlement of numerous perſons, belonging to a ſingular ſect of Chriſtians, called, on account of their tenets, the Unitas Fratrum; and Moravians, becauſe firſt founded by count Zinzendorf, in the province of Moravia. The place, originally named Lamb's-hill, had its preſent denomination given to it by the new inhabitants. The ſettlement is pleaſantly ſituated on the ſlope of a riſing ground, at the foot of which runs a meandering ſtream. It conſiſts chiefly of two long ſtreets, the houſes of which are neatly built, and an elegant ſtructure near the centre contains a chapel and ſeminary. There are two inſtitutions nearly reſembling a monaſtery and nunnery, which go under the ſingular appellations of "The Young Men's Economy, and the Young Women's Economy." No ſtrangers of the oppoſite ſex are admitted in either houſe, but the inhabitants may occaſionally come out to converſe with their friends. They are allowed to follow any buſineſs moſt eligible to themſelves, and, fixed by no vows, they are at liberty, whenever they pleaſe, to change their way of life. The number of women is about ſixty, who are principally occupied in ſpinning, tambour, and embroidery, and they ſleep together in one large room. The men, who amount to about fifty, ſleep alſo in a common dormitory, and are chiefly employed in the different branches of the clothing trade.

Originally the number of ſettlers of this perſuaſion was upwards of four hundred, but the population of Fulneck has been latterly on the decline. Many who at firſt joined for the ſake of novelty have ſeceded; and the ſeparation of the ſexes, according to the principles of their founder, and the rules adopted by themſelves, together with their peculiar management in conducting trade, is little calculated, either to increaſe population or extend manufactures.

FULNECK, a town of Moravia, in the circle of Prerau, is a place of conſiderable importance in the Moravian church; 21 miles N.E. of Prerau. N. lat. 49° 37'. E. long. 17° 51'.

FULTA, a town of Hindooſtan, in Bengal, on the E. ſide of the Hoogly; 24 miles S.S.W. of Calcutta.

FULTAWARY, a town of Hindooſtan, in Bengal; 26 miles N. of Purneah.

FULUSCULUM, in *Botany*, a name given by the ancient Romans to a peculiar ſpecies of mullein or verbaſcum, of which they uſed to make the wicks of the torches with which they kindled their funeral piles. The Greeks for the ſame reaſon called this ſpecies necuia. Dioſcorides indeed calls it *lychnitis*, λυχνιτις; and Nicander, *thryallis*, θρυαλλις. The way they uſed it was thus; they beat out the ſtalk of the plant, as we do hemp, and when it was ſeparated into looſe fibres, they plunged it into melted reſin; this gave it a conſiſtence again, and when cold, it was a kind of flambeau.

FULWAR, in *Geography*, a town of Hindooſtan, in the ſoubah of Lahore, on the Setledge; 100 miles S. E. of Lahore.

FUMADOES, in *Commerce*, a name given to pilchards, garbaged and ſalted, then hung in the ſmoke and preſſed; ſo called in Spain and Italy, whither they are exported in great abundance. Vid. Stat. 14 Car. II. cap. 31.

FUMAGE, a term uſed in ſome parts of the kingdom, for dung, or manuring with dung.

FUMAGE. See FUAGE.

FUMANI, ADAM, in *Biography*, was born at Verona in the ſixteenth century, and by his ſkill and acquirements in the ancient languages, he obtained the friendſhip of the moſt eminent ſcholars of his time. He accompanied cardinal Pole in his legation to Flanders, and Navagero to the council of Trent, to which aſſembly he was appointed ſecretary. He held likewiſe ſome church preferment. He tranſlated from the Greek into Latin the works of St. Baſil. He compoſed many poetical pieces, of which the moſt remarkable was "A Syſtem of Logic," in Latin heroics, in five books, which he treated with an elegance and eaſe which are altogether ſurpriſing, and prove the author's facility in the management of verſe and language. It was not printed till the year 1739, in an edition of the works of Fraſcatorius. Moreri.

FUMARIA, in *Botany*, from *fumus*, ſmoke, it having been called by old writers *fumus terræ*, ſmoke of the ground, we know not for what reaſon. Hence the Engliſh name, Fumitory. Linn. Gen. 849. Schreb. 1154. Willd. Sp. Pl. v. 3. Mart. Mill. Dict. v. 2. Juſſ. 237. Claſs and order, *Diadelphia Hexandria*. Nat. Ord. *Corydales*, Linn. *Papaveraceæ*, Juſſ.

Gen. Ch. *Cal.* Perianth inferior, of two equal, ſmall leaves, moſtly deciduous, often coloured. *Cor.* tubular, ringent, of two petals, each lobed and ſpreading at the extremity, gibbous, and holding honey at the baſe, variouſly formed in different ſpecies. *Stam.* Filaments ſix, capillary, united into two ſets by their broad, elongated, membranous baſes, ſheathing the germen; anthers ſmall, roundiſh, vertical. *Piſt.* Germen roundiſh or oblong; ſtyle curved or oblique; ſtigma obtuſe. *Peric.* Pod of two valves, and one cell. *Seeds* one or more, roundiſh.

Eſſ. Ch. Calyx of two leaves, inferior. Corolla ringent, gibbous and honey-bearing at the baſe. Each filament bearing three anthers.

Obſ. This genus, as underſtood by Linnæus and his followers, is extremely natural, but the ſeed-veſſel is ſo very different in many of the different ſpecies, that Gærtner, whoſe ſtudies were peculiarly directed to that part of the fructification of plants, has, on this principle alone, ſeparated *Fumaria* into ſeveral new genera. We are more diſpoſed to agree with Linnæus, eſpecially as the ſeed-veſſels in queſtion ſeem to us, in many caſes, to differ rather in appearance than in reality.

Some ſpecies of *Fumaria* have a ſingle protuberance at the baſe of the corolla, others a double one, which in a few becomes a ſpur. Six of the former diviſion are natives of Britain, but none of the latter. *F. ſolida*, Engl. Bot. t. 1471, is common in gardens, though rarely wild with us. It flowers in the ſpring, and mixes prettily with harebells, anemonies and daffodils. *F. lutea*, t. 588, found on rocks and old walls in the north, is a doubtful native, but very frequent in gardens, where it ſoon becomes a weed. Theſe two have a many-ſeeded pod. The vulgar *F. officinalis*, t. 589, and the rare *F. parviflora*, t. 590, and *capreolata*, t. 943, all agree in their elegant little pink bloſſoms, variegated with ſpots of dark red and of green, as well as in having round ſingle-ſeeded pods. *F. claviculata*, t. 103. has green and white flowers, and a very delicate climbing herbage. Its pods have ſeveral ſeeds, but its cloſe generic affinity to the three preceding cannot be diſputed.

The exotic *Fumariæ* are ſeveral. Among thoſe with two protuberances at the baſe of the flower is *F. ſpectabilis*, a native of Siberia or Tartary, as far as we can diſcover. It is cultivated by the Chineſe, and ſometimes ſeen among their drawings

drawings of ornamental plants, being extremely handſome. A figure is given of this ſpecies in the ſeventh volume of the *Amœnitates Academicæ* from a ſpecimen in the Linnæan herbarium, the only one we have ever met with in any collection. A very elegant Siberian ſpecies has been ignorantly called *ſpectabilis* in the Engliſh gardens, and is figured by Mr. Andrews in his Repoſitory. This has much ſmaller flowers and leaves than the true one, but deſerves cultivation, as it thrives well in peat earth in the open ground, and bloſſoms abundantly. The American *F. ſempervirens*, conſpicuous for its glaucous leaves, and red and yellow corolla, is alſo a very pretty garden plant.

Fumaria, in *Gardening*, comprehends plants of the tuberous-rooted low-flowery perennial kind; of which the ſpecies moſtly cultivated are, the naked ſtalked fumitory (F. cucullaria); the glaucous fumitory (F. ſempervirens); the yellow fumitory (F. lutea); and the white-flowered fumitory (F. capnoides.)

Theſe plants are deſerving of ſituations in the flower-garden, and different compartments of ornamented grounds, as the fore-parts of clumps, borders, &c.

Method of Culture.—Theſe plants muſt be raiſed in different ways according to the kinds. The firſt ſort is readily increaſed by planting the off-ſets taken from the old roots in a light ſoil where the ſituation is rather ſhady, in the early part of the autumn, as ſoon as the old ſtems begin to decay. They ſhould afterwards be kept perfectly free from weeds.

All the other ſorts are capable of being raiſed by ſowing the well-ripened ſeeds in ſituations where the plants are to grow. They afterwards only require to be kept perfectly clean from weeds.

Fumaria, in the *Materia Medica*, was by the ancients named "Capnos," becauſe it was thought to be peculiarly uſeful in dimneſs of ſight, and other diſeaſes of the eyes. The leaves, which are the part of the plant directed for medicinal uſe by the Edinburgh college, are extremely ſucculent, and have no remarkable ſmell, but a bitter, ſomewhat ſaline taſte. Fumitory has been ſuppoſed by ſeveral phyſicians of great authority, both ancient and modern, to be very efficacious in opening obſtructions, and infarctions of the viſcera, particularly thoſe of the hepatic ſyſtem; it is alſo highly commended for its power of correcting a ſcorbutic and acrimonious ſtate of the fluids, and has therefore been employed in various cutaneous diſeaſes: when taken in pretty large doſes it proves diuretic and laxative, eſpecially the juice, which may be mixed with whey, and uſed as a common drink. Dr. Cullen claſſes this plant among the tonics. Its remarkable virtues, he ſays, are thoſe of clearing the ſkin of many diſeaſes, and he experienced its good effects in many inſtances of cutaneous affections, which he would call lepra. He commonly uſed it by expreſſing the juice, and giving that to the quantity of two ounces twice a day. He adds that the virtues remain in the dried plant, ſo that they may be extracted by infuſion or decoction, in water; and the foreign diſpenſatories have prepared an extract of it, to which they aſcribe all the virtues of the freſh plant. An infuſion of the leaves is uſed as a coſmetic, to remove freckles and clear the ſkin. Woodville Med. Bot.

FUMAY, in *Geography*, a town of France, in the department of the Ardennes, and chief place of a canton in the diſtrict of Rocroy. The place contains 1740, and the canton 6795 inhabitants, on a territory of 240 kiliometres in nine communes. The principal article of its trade is ſlates, of which there are quarries near the town. N. lat. 50°. E. long. 4° 44'.

FUMBO, one of the Querimba iſlands in the Indian ſea. S. lat. 13° 6'.

FUMEL, a town of France, in the department of the Lot and Garonne, and chief place of a canton in the diſtrict of Villeneuve-d'-Agen, 9 miles E.S.E. of Montflanquin. The place contains 2079, and the canton 8465 inhabitants, on a territory of 167½ kiliometres in 8 communes.

FUMEN, a town of Perſia, in the province of Ghilan; 10 miles N.W. of Reſhd.

FUMET, a term uſed among ſportſmen for the ordure or dung of harts: otherwiſe called fewmets.

FUMIGATION, in *Medicine*, the diffuſion of various ſubſtances in the form of vapour or gas, with a view to correct the air, when vitiated by the putrefaction of animal and vegetable matter, or by contagious effluvia.

As the air has been liable to vitiation by fœtid and offenſive effluvia, from the time that men were in the habit of aſſociating in numbers; ſo, from the earlieſt ages, the diffuſion of other effluvia, whether of a fragrant or a pungent quality, through the air, as an antidote to its diſagreeable or unwholeſome qualities, has been often reſorted to. We have already obſerved, that Hippocrates and Acron of Agrigentum, when the plague raged at Athens, ordered large piles of wood to be burnt in the ſtreets, with a view of correcting the ſuppoſed vitiated condition of the atmoſphere. (See Contagion.) The ſame expedient has been reſorted to in modern times, during the prevalence of the plague in London, Marſeilles, Toulon, &c. ſo that theſe cities were enveloped in a cloud of ſmoke for two or three days; but in London a great increaſe in the number of deaths took place on the night following; and at Marſeilles, the hiſtorian obſerves, this ſmoke augmented the natural heat of the climate and ſeaſon, and ſeemed to increaſe the activity of the contagion. (Papon, de la Peſte, &c. tom. i. p. 234.) The burning of wood, indeed, produces an acid, which has been hence denominated the *pyro-ligneous acid*, and which is ſufficiently obvious from the ſmarting ſenſation which the ſmoke of wood occaſions in the eyes; but experience proves its operation in deſtroying contagion to be comparatively feeble. The effect of a dry confined heat in purifying clothes, or other fomites, from the contagious matter which they may contain, as mentioned by Dr. Lind, depends altogether upon another operation of heat, diſtinct from fumigation by the vapours of the ſubſtances burnt. But M. Guyton Morveau has remarked, that the burning of three truſſes of ſtraw in the cell of a priſon, in a moſt intolerably offenſive condition, did not remove the putrid ſmell. (Traité des Moyens de deſinfecter l'Air, p. 12.)

Next to the burning of wood, the vapours of burning ſulphur have been generally employed with a view to deſtroy the matter of contagion. This vapour is the ſulphureous acid gas, or volatile vitriolic acid of the old chemiſts; and its efficacy in the deſtruction of contagion has been long eſtabliſhed; but as, even in ſmall quantity, it affects the reſpiration of animals, and in larger quantity will occaſion ſuffocation and death, it can only be employed for fumigating clothes, furniture, or empty apartments, to the individual parts of which the fumes can be directly applied.

The deflagration of gunpowder was eſteemed "next to the ſmoke of wood for purifying a tainted air," by Dr. Lind, (On Fevers and Infections, p. 51.) But the products, which it yields, are inadequate to the deſtruction of the contagious miaſms. Perhaps its principal operation conſiſts in giving movement to a large maſs of air, and thus diſplacing ſome of the contagious effluvia, without deſtroying them, or in diffuſing them through a larger volume of air, and therefore weakening their force. The deflagration of nitre was tried by Dr. Carmichael Smyth in the hoſpital wards at Wincheſter, upon the notion that nitrous acid was

was difengaged by the combuftion ; but a farther acquaintance with chemiftry convinced him of his miftake. (See his Defcript. of the Jail Diftemper, &c. p. 174.)

With refpect to all perfumes, and other aromatic, refinous, and balfamic fubftances, they are utterly profcribed upon the authority of general experience. "It is obvious," fay the intelligent authors of a pamphlet of inftructions for the people, publifhed during an epidemic in France, "that thefe ftrong fmelling fubftances are far from poffeffing the wonderful properties attributed to them ; in fact, they afford a treacherous fecurity. This vapour furnifhes no new air ; exerting no action on that with which it mingles, it ferves only to conceal the bad fmells, without deftroying them." (Morveau, loc. cit. p. 158.) This is to put a mafk on the enemy, and then to miftake him for a friend. By feveral direct experiments, M. Morveau afcertained the feeble powers of the vapours of various odoriferous and volatile fubftances, in deftroying or concealing the offenfive exhalations arifing from putrid animal matter. He found that by burning benzoin, &c. by fpirituous folutions of this refin, and of the balfam of Peru, of ftyrax, and of myrrh, the odour of thefe fubftances was only mixed with that of the putrid matter ; and however predominant it was, it did not prevent him from difcerning the prefence of the putrid air by an exceffively difagreeable faint fmell. (Loc. cit. Exper. XII—XV.) The fame obfervation is applicable to the vapour of tar, which Dr. Lind imagined was poffeffed of fome efficacy.

The acetous acid, or common vinegar, when evaporated by heat, has been often employed as a fumigation in infected apartments ; and the experiments of the intelligent French chemift, juft mentioned, evince that it is poffeffed of fome little power in diminifhing the fetid odour of putrid air. The acetic acid, or radical vinegar, as it has been called, is more efficacious in removing the offenfive properties of this air. He obferves, however, that its powers are limited to a very fmall fpace ; and therefore that, although it may be ufeful about the perfons of thofe who are compelled to be much about the fick, it is altogether inadequate to the purification of large rooms ; not to mention the great expenfe of its preparation. When the fumes of vinegar are attempted to be obtained by throwing it on burning coals, the greater part of the acid is actually decompofed, and therefore its efficacy is in a great meafure loft. The anti-peftilential vinegar, or "vinegar of the four thieves," which has been greatly extolled, was found very ineffectual in correcting the putrid air with which it was agitated : indeed as the aromatic fubftances, from which its pretended virtues were faid to be derived, are themfelves inefficacious, the combination could not be expected to be poffeffed of much power.

In thofe mineral acids, however, which are capable of being converted into vapours, modern refearch has difcovered very efficacious agents, it would appear, for deftroying the matter of contagion ; fuch are the nitrous or rather nitric acid gas, the muriatic, and the oxygenated muriatic acid gas. Thefe gafes not only have the advantage of decompofing the miafms of contagion, but alfo of being refpirable in a ftate of moderate dilution or diffufion, fo as to admit of being ufed in the wards of hofpitals, or other inhabited apartments. There has been fome controverfy with regard to the priority of the difcovery of the anti-contagious property of the vapours of thefe mineral acids, in confequence of a parliamentary reward of 5000 pounds having been given to Dr. Carmichael Smyth for the difcovery. Of the three individuals, who may poffibly have each been led to the experiment without any affiftance from the other, it feems to be certain that Dr. Smyth was the laft to refort to it ; although he was perhaps the firft to employ one of thefe acid vapours, *viz.* the nitrous. It has been fhewn, we think fatisfactorily, by Dr. John Johnftone, of Birmingham, that his father, Dr. James Johnftone, fenior, had employed the vapour of muriatic acid in an epidemic fever at Kidderminfter in the year 1756, and recommended it in "An hiftorical Differtation" concerning that epidemic, publifhed in 1758. (See a pamphlet entitled, "Account of the difcovery of the mineral acids in a ftate of gas to deftroy contagion," 1803 : alfo, a "Reply to Dr. J. C. Smyth, &c." 1805.) In the year 1773, M. Guyton de Morveau, of Dijon, publifhed an account of the efficacy of the vapour of muriatic acid, in purifying the putrid air of a church in that city, which had been rendered ufelefs, and was fhut up, in confequence of the opening of fome vaults within it. (See Rozier, Journal de Phyfique, tom. i. p. 436. Juin, 1773.) This ingenious chemift appears to have been led to the experiment upon a piece of hypothefis, that the muriatic acid gas would neutralize the ammoniacal falts, which are generated during putrefaction. The experiment fucceeded perfectly, and the tainted air, before intolerable to refpiration, was completely deprived of its offenfive qualities. It was not until the year 1795, that Dr. Smyth recommended the nitrous acid gas as the means of deftroying contagion, and directed an experiment which was made in the Union, a hofpital-fhip, and again in part of the Ruffian fquadron, at Sheernefs. The fuccefs of this experiment was nearly as complete as that of M. de Morveau, at Dijon. The immediate effect of the fumigation was to deftroy the offenfive fmell arifing from fo many fick crowded together ; none of the attendants were afterwards attacked with the fever ; and the general ftate of the fhip was fpeedily improved. (See Report of the experiments, &c. by Mr. A. Menzies.)

Such is the hiftory of this difcovery ; and the efficacy of the nitrous and muriatic fumigation has been confirmed by the fubfequent experience of other naval medical officers, and of the phyficians to the houfes of recovery for contagious fever, eftablifhed in various parts of the kingdom. It remains for us, therefore, to defcribe the mode in which the fumigation is performed.

"To obtain the nitrous or marine acid, in a ftate of vapour," Dr. C. Smith obferves, "the method is extremely fimple. It confifts in decompofing nitre or common falt, by means of heated vitriolic acid, which may be done as follows. Put half an ounce of vitriolic acid" (the undiluted fulphuric acid, or oil of vitriol of commerce) "into a crucible, or into a glafs or china cup, or deep faucer ; warm this over a lamp, or in heated fand, adding to it from time to time fome nitre or common falt : thefe veffels fhould be placed at twenty or thirty feet diftance from each other, according to the height of the cieling or virulence of the contagion." (Smyth on the Jail Diftemper, p. 198.) With refpect to the nitric acid vapour, however, it was obferved by Dr. Odier of Geneva that, when heat was employed, it was extremely difficult to avoid the extrication of the red fumes of nitrous acid, which are very injurious to refpiration ; and that by mixing the ingredients cold, an equal quantity of the vapours of nitric acid was obtained. In the Houfe of Recovery, in London, this method is purfued, and the following formula is adopted in the fumigation of fmall apartments, "Take an equal quantity of powdered nitre and ftrong vitriolic acid or oil of vitriol (about fix drachms of each are fufficient); mix them in a tea-cup, ftirring them occafionally with a tobacco-pipe or piece of glafs ; the cup muft be removed occafionally to different parts of the room, and the fumes

fumes will continue to arife for feveral hours. The oil of vitriol fhould be taken by meafure, not by weight." (See Reports of the Fever Inftitution.) On board the Union, hofpital-fhip, the mixed ingredients in the cup were carried about the fhip in earthen pipkins containing hot fand. M. Morveau informs us that the muriatic fumigation, when common falt, or muriate of foda, is employed, may alfo be effected without the aid of heat. M. Morveau confiders the oxy-muriatic acid vapour, however, as the moft effectual deftroyer of contagion; but Dr. Smyth was led to reject this acid, from a notion that it was not refpirable, and therefore could not be employed in inhabited apartments: both the experiments of Morveau, however, and of Mr. Cruikfhank, of Woolwich, have fhewn the fafety and practicability of ufing this acid gas in fumigation. The following are the quantities and proportions of the neceffary ingredients, which M. Morveau employed in a ward, containing ten beds.

	oz.	gros.	gr.		
Common falt - -	3	2	10	or 10	decagrams.
Black oxide of manganefe	0	5	17	— 2	
Water - - -	1	2	35	— 4	
Sulphuric acid - -	1	7	50	— 6	

The oxide is firft reduced to powder, and then mixed with the falt by trituration; this mixture is then put into a glafs or china veffel, and the water added; laftly, the acid is poured upon thofe ingredients, at once, if the fumigation is made in uninhabited apartments; but in fucceffive portions if the rooms are inhabited. The following proportions were employed by Mr. Cruikfhank.

Muriate of foda - -	2 parts
Oxide of manganefe -	1
Water - - -	$1\frac{1}{2}$
Sulphuric acid of 36 degrees	2. (See Rollo on Diabetes.)

M. Morveau, who is fatisfied that oxygenated muriatic acid gas is the moft efficacious prefervative againft infection, "l'anti-contagieux par excellence," fuggefts a mode of obtaining this gas extemporaneoufly; *viz.* by pouring upon a drachm of the oxide of manganefe, in a four ounce bottle, about $2\frac{1}{2}$ ounces of the nitro-muriatic acid. The vapour of the oxy-muriatic acid is immediately difengaged in confiderable intenfity.

Although thefe mineral acid vapours are obvioufly poffeffed of the power of deftroying putrid effluvia, and the contagious miafms arifing from typhoid fevers, dyfentery, foul ulcers, &c.; the extent of their power upon the contagious matter of fmall-pox, fcarlet-fever, meafles, &c. is not yet fufficiently afcertained. The only evidence with which we are acquainted relative to this part of the fubject, is the following obfervation of Dr. Smyth. After ftating that in ordinary cafes, and in private practice, he found that one, two, or three fumigating lamps, by which a conftant fumigation is kept up, night and day, fo as to pafs over the beds of the fick, are perfectly fufficient, he adds: "In this manner I have not only ftopped the common contagion in the hofpital and in private, but I have equally fucceeded, which is of great confequence to be known, in preventing the fcarlatina anginofa, or putrid fore throat, from being communicated to the reft of the family, living under the fame roof. Whether this will apply to the fmall pox, I cannot fay from my own experience; but I have been told by Dr. Rollo, furgeon to the artillery, and Mr. Cruikfhank, profeffor royal of chemiftry to the academy at Woolwich, that it deftroys the miafma of fmall pox; and that of two quantities of matter, taken for the purpofe of inoculation, one was expofed to the nitrous vapour, the other not: the perfons inoculated with the firft were not feized with the difeafe, whilft the inoculation took the ufual effect, when performed with the fecond." (See Dr. Smyth's treatife "On the Effect of the Nitrous Vapour," &c. p. 221.)

Fumigation, *Powder of*, was invented at Mofcow, in 1771, for preventing the infection of the plague. It is prepared of different degrees of ftrength in the following manner: 1. Take leaves of juniper, juniper-berries pounded, ears of wheat, guaiacum wood pounded, or, if this cannot be had, the cones of pines or firs, of each fix pounds; common falt-petre pounded, eight pounds; fulphur pounded, fix pounds; Smyrna tar or myrrh, or, inftead of this, the common tar of pines and firs, two pounds; mix all thefe ingredients together, and they will produce a pood of the powder of the firft ftrength. 2. Take fouthernwood or mugwort, cut into fmall pieces, five pounds; leaves of juniper, cut in the fame manner, four pounds; juniper-berries pounded, three pounds; common falt-petre pounded, four pounds; fulphur pounded, two pounds and a half; Smyrna tar or myrrh, one pound and a half; mix thefe together, and they will yield half a pood of the powder of the fecond ftrength. The efficacy of the powder of fumigation was tried on ten malefactors under fentence of death, who were confined three weeks in a lazarette, and expofed in every poffible way to the infection of the plague, and none of them were at all injured by it.

Fumigation is alfo ufed for the act of making a fufpended body receive the fumes of or fteams of one or more other bodies, in order to calcine, to correct it, or impart to it fome new quality.

Cerufs is made by the fumigation, or vapour, of vinegar, gnawing and corroding plates of lead.

Fumigation, is a practice, in *Surgery*, of applying remedies, in the form of fmoke, to the furface of the body, or to that of ulcers, tumours, &c. It is one of the moft ancient plans of affecting the conftitution with mercury, and Lalonette and Albernethy have ftated circumftances in its favour, which certainly render it fometimes a very eligible mode. The latter is of opinion, that if the peculiar advantages of mercurial fumigations were generally known to practitioners, they would be much more frequently employed. The advantages of the method confift in its affecting the conftitution, when other means have failed, and in producing its effects in a much fhorter time than any other mode requires. How defirable this celerity of operation muft often be, when venereal ulceration is making great ravages in the palate, throat, &c. it is needlefs to infift upon. In patients, who have not ftrength to rub in ointment, and whofe bowels will not bear the internal exhibition of mercury, the mode of fumigation may prove of great fervice.

"In the year 1776, the Chevalier Lalonette, a phyfician at Paris, laid before the public an account of a new mode of mercurial fumigation, free from the inconveniences of former ones, and which, in the fpace of thirty-five years, he had fuccefsfully employed in more than four hundred cafes, that had refifted all the ordinary methods of cure. His method confifted in inclofing the patient, previoufly undreffed, in a kind of box refembling a fedan-chair, with an opening at the top to let out the head, and another at the bottom, to which was fitted a fmall grate or furnace, having in it a heated iron for converting the mercurial remedy into fume. The preparation he made ufe of was a kind of calomel, which, by repeated fublimation from iron filings, was fo far deprived of its muriatic acid, as to be in part reduced into running quickfilver; and while it poffeffed confiderable volatility, was perfectly unirritating. Some of this powder, being ftrewed upon the hot iron placed below, was immediately converted into fmoke, which furrounded the patient's

 body,

body, and after ſome time ſettled on his ſkin in the form of a white and very fine calx of quickſilver: a complete dreſs, having its inner ſurface fumigated with the ſame powder, was then put on. The remedy, being thus generally applied to the mouths of the cutaneous abſorbents, ſoon got admiſſion into the circulating fluids, and the conſtitution became thereby more ſpeedily affected, than by any other proceſs known before." (Abernethy's Surgical and Phyſiological Eſſays, part 3.)

As the fumigating powder uſed by M. Lalonette was very operoſe, and conſequently a very expenſive preparation, and appeared to have no advantages over one made by abſtracting the muriatic acid from calomel by means of volatile alkali, Mr. A. has always employed the latter, which is prepared at the hoſpital in the following manner: Two drachms of aqua ammoniæ are added to ſix ounces of diſtilled water, and four ounces of calomel are thrown into this liquor, and ſhaken up with it; the powder is afterwards ſeparated by a filter, and dried.

The powder thus obtained is of a grey colour, and contains a good deal of quickſilver in its metallic ſtate, which of courſe is extremely volatile, but becomes oxydated when raiſed into fume, and afterwards condenſed into a white ſubtile powder.

Mr. A. never knew this method fail in curing the lues venerea.

In local diſeaſe of the joints, ſuch, for inſtance, as frequently takes place in the knee, and in ſarcomatous enlargements of the breaſt in women, Mr. Sharp, and ſir C. Blicke, have long been accuſtomed to direct fumigated ſtockings, or under-waiſtcoats, to be worn; by which the complaints have been relieved, and the conſtitutions of the patients affected, without the trouble and unpleaſantneſs ariſing from the uſe of the common mercurial ointment. (See Abernethy's Surgical and Phyſiological Eſſays, part 3.)

Mr. Pearſon procured Lalonette's machine, and made a conſiderable number of experiments to determine the comparative advantages of this method and mercurial frictions. He found, that the gums became turgid and tender very quickly, and that the local appearances were ſooner removed, than by the other modes of introducing mercury into the ſyſtem; but that it ſoon brought on debility, a rapid and premature ſalivation, and, of courſe, the medicine could not be ſteadily continued. This gentleman concludes, that where checking the progreſs of the diſeaſe ſuddenly is an object of great moment, where the body is covered with venereal ulcers, or where the eruptions are large and numerous, ſo that there ſcarcely remains a ſurface large enough to abſorb the ointment, the vapour of mercury will be advantageous. But he thinks it extremely difficult thus to introduce a ſufficient quantity of mercury into the ſyſtem to ſecure the patient from a relapſe, and therefore by no means eligible as a general practice. The vapour of mercury, he ſays, is ſingularly efficacious when applied to venereal ulcers, fungi, and excreſcences; but this plan requires an equal quantity of mercury to be given in other ways, as if the local application itſelf were not a mercurial one. (Pearſon on Lues Venerea, p. 145, &c.)

For the purpoſe of fumigating ſores, the hydrargyrus ſulphuratus ruber is commonly uſed. Ulcers and excreſcences about the pudendum and anus in women are ſaid to be particularly benefited in this way; and in theſe caſes the fumes are moſt conveniently applied by placing a red-hot heater at the bottom of a night-ſtool pan, and after ſprinkling on it a few grains of the red ſulphurated quickſilver, placing the patient on the ſtool. On other occaſions, a ſmall apparatus, ſold at the ſhops, is uſed, which enables the ſurgeon to direct the fumes through a funnel againſt the ulcer in any ſituation.

Though mention has juſt been made of venereal excreſcences, it is very queſtionable, whether any are ever really of this nature. Many excreſcences and verrucæ about the anus, and parts of generation, diminiſh and are cured by a courſe of mercury. This is the only argument in favour of their being venereal; for, when tied, cut off, or made to fall off by ſtimulating them with pulv. ſabinæ and ærugo æris, they are as effectually cured, as if mercury had been given. Cooper's Dictionary of Practical Surgery, art. *Mercury*.

FUMIGATOR, formed of *fumus*, ſmoke, an inſtrument uſed for injecting clyſters of the ſmoke of tobacco. Clyſters of this kind have been applied in the iliac paſſion, in the hernia incarcerata, and in other caſes of an obſtinate conſtipation, or obſtruction of the bowels; and as they are admirably adapted to excite the ſuſpended or extremely languid periſtaltic motion of the inteſtines, which are reckoned among the moſt irritable parts of the body, and are allowed to retain the vital influence longer than any other, they have been peculiarly ſerviceable in caſes of recovery from apparent death by drowning, &c. The inſtrument commonly uſed for the injection of theſe clyſters is formed with an iron or braſs capſula for containing a certain quantity of tobacco, to which capſula are faſtened two pipes; one of them made of bone, to be inſerted into the anus; and the other of ivory, in the ſhape of that end of the trumpet which is applied to the mouth; by means of which the ſmoke of the burning tobacco in the capſula is forced through the firſt pipe into the anus. The Dutch have made the bowl of this inſtrument large enough to contain three-fourths of an ounce of tobacco; it is conſtructed of wood, lined with braſs or tin, and covered by a top of wood lined in the ſame manner; the top is ſcrewed upon the other; the inſtrument is uſed by means of a wooden tube or blow-pipe, ſcrewed to the top, and adapted either to the mouth, or to a pair of bellows. The inſtrument uſed by the French is compoſed of a box reſembling the bowl of a pipe, covered by a lid, at the upper part of which is a hole or chimney, for giving air to the tobacco at pleaſure. From the ſide of this cover proceeds a tube, about four inches in length, incorporated with it, and adapted at the other extremity to the end of a flexible tube. At the lower part of this box is inſerted a kind of tubular handle, which admits the nozzle of a pair of bellows, faſtened to it by means of an iron pin paſſing tranſverſely through both. By this contrivance, when the tobacco is lighted, it is not neceſſary to touch the heated box; and the bellows ſerves as a handle by which to direct all the neceſſary movements: the whole inſtrument is made of copper.

Mr. Wriggleſworth, in conſequence of hints and obſervations communicated to him by Dr. Cogan, has conſtructed a fumigator, free from the inconveniences attending thoſe already mentioned. The bowl or body of this new inſtrument is made of caſt braſs, and is large enough to contain about an ounce and a half of tobacco. The pipe projecting from the lower part of it is bored out of a ſolid piece of braſs, and alſo thoſe to which each extremity of the leathern tube is affixed. The cover is likewiſe made of caſt braſs; from the upper extremity of which projects a neck about an inch and a half in length, the opening or bore of it being about half an inch in diameter. The cover is fixed to the box by means of two notches made on each ſide of a circular ridge or edge, admitting two ears, that project from the upper part of the box, which by a circular motion lock upon the brim. The

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FUNCTION, in *Analyſis.* The function of any quantity, as x, is any algebraic expreſſion of calculation into which x enters, mixed with other quantities that have invariable values; thus $\frac{1}{1+x}$, $(1+x^2)$, $(1+x)^3$, $(1+bx)^m$ log. x, &c. are all expreſſions which may be called functions of x: x is here ſuppoſed to be a variable quantity, and the object of the theory of analytic functions is to inveſtigate rules and proceſſes for determining in what manner certain variations of the quantity x will affect the values of the expreſſions, which, like the above, are functions of x.

Though the theory of analytic functions is ſo comprehenſive as to embrace the whole doctrine of variable quantities, or magnitudes, of what nature ſoever, yet it is nothing more than a continuation or branch of common algebra. It requires no new hypotheſis, but derives all its rules from the nature of the ſymbolical language adopted in that ſcience, and from the ſignification which by convention has been given to various analytical expreſſions. In its application to the inveſtigation of problems, it is analogous to the differential or fluxional calculus, but free from the objection ſo often urged againſt thoſe methods. Principles derived from the doctrine of bodies in motion, when applied to the inveſtigation of ſimple analytical expreſſions, ſeem evidently very remote from the ſubject in queſtion, and from that circumſtance alone we might very reaſonably be induced to ſuſpect the exiſtence of ſome other more appropriate method.

Surely it cannot be neceſſary to have recourſe to mechanical principles to ſhew what is the product of $a + x$ multiplied by $a + x$ a certain number of times, yet this is continually done by writers on fluxions, when they attempt to demonſtrate the binomial theorem by proceſſes derived from the principles of motion. It may ſometimes however happen that we are guided in our path to the diſcovery of general principles, from reflecting on the circumſtances which take place in partial inſtances. This has been the caſe in the doctrine of fluxions. The relation between the time employed and the ſpace deſcribed by a body in motion has given riſe to our idea of velocity; and from conſiderations drawn from theſe particular variable quantities, ſome principles have been deviſed, which it appears are applicable to variable quantities in general; yet the more logical method would certainly have been, firſt to have eſtabliſhed the law of variable magnitudes generally, and then to have ſhewn their application to the particular caſe of a body in motion.

It was a celebrated mathematician of our own country, Landen, who firſt propoſed to treat the fluxionary calculus as a branch of common algebra, but the method which he propoſes to ſubſtitute for it, is not only ſomewhat objectionable in its principle, but very incommodious in its practical application.

In the year 1772, M. Lagrange, in the Memoirs of the Academy of Berlin, firſt undertook to explain in what manner the fluxionary or differential calculus was included in the theory of the expanſion, in a ſeries of analytic functions. This celebrated work, entitled "Théorie des Fonctions Analytiques," appeared in 1796; it has ſince been illuſtrated and extended in another publication, "Leçons ſur le Calcul des Fonctions," 1806.

In theſe works the reader will find the whole theory of variable quantities completely developed, and applied to a great variety of important inveſtigations. Though we have no book in our own language which treats this ſubject on ſo extenſive a ſcale, yet the theory and principles on which the whole of this calculus depends, have been moſt ably explained by R. Woodhouſe, eſq. F.R.S. of Cambridge, in his "Principles of Analytical Calculation," a work which, for clearneſs, elegance, and perſpicuity, will probably for a long time remain unrivalled, and can never be excelled.

It is from theſe publications, and particularly the laſt, that the preſent abſtract is profeſſedly compoſed. But to enable the reader to comprehend the object propoſed, we ſhall endeavour to illuſtrate it by ſome very eaſy and ſimple examples.

Suppoſe $y = ax$, x being a variable quantity, y is then ſaid to be a function of x, ſince it depends on x for its value. If x aſſumes a new value, and becomes $x + \Delta x$ (Δx expreſſing the increment of x) y will require a new value, expreſſed in like manner by $y + \Delta y$. In this caſe we ſee immediately how the propoſed alteration in the value of x will affect the value of y; for ſubſtitute $x + \Delta x$ for x in the expreſſion ax, and it becomes $ax + a.\Delta x$. Therefore

$$y + \Delta y = ax + a.\Delta x;$$
and $$\Delta y = a.\Delta x.$$

It appears, therefore, that in the above equation, $y = ax$, if any variation is made in the value of x, the correſponding alteration in the value of y is a times as great.

Again, ſuppoſe $y = x^3$;
let x become $x + \Delta x$; then

$$y + \Delta y = x^3 + 3x^2.\Delta x + 3x.(\Delta x)^2 + (\Delta x)^3$$
and $$\Delta y = 3x^2.\Delta x + 3x.(\Delta x)^2 + (\Delta x)^3.$$

In the firſt of the above examples, Δy, or the new value of y, conſiſts of a ſingle term, namely, Δx with a co-efficient. In the ſecond example, Δy conſiſts of a ſeries of ſeveral terms, the firſt of which is Δx, with a certain co-efficient; the others contain regular aſcending powers of Δx, Δx^2, Δx^3, with their reſpective co-efficients.

It will be ſeen that it is under this form that Δy, or the new value of ϕx or y, may be moſt commonly obtained.

The object of reſearch is to find one or more terms, and ſometimes the whole of this ſeries, from the given relation between ϕx and x, and ſometimes the reverſe; or to find from one or more of theſe terms the original relation that ſubſiſted between ϕx and x. Theſe two methods, namely, the direct and reverſe, are analogous to the finding fluxions and fluents in the uſual fluxionary calculus.

If y be any function of $x = \phi x$, and its new value $y + \Delta y$ be obtained in the form of a ſeries aſcending according to the powers of Δx, then the firſt term of that ſeries, conſiſting of Δx and its co-efficient, is called the firſt derived function, or the differential of the variable quantity: it is the ſame as the fluxion of that quantity, but we do not obtain it in conſequence of any particular hypotheſis. The differential is only known to be the firſt term in conſequence of a previous definition, entirely arbitrary. The fluxion of a quantity is, on the contrary, obtained in conſequence of a particular theory; therefore, in whatever proceſs it is applied,

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Function is alſo uſed figuratively in ſpeaking of the offices, duties, or occupations in which a perſon is engaged.

The actions of an ambaſſador muſt be diſtinguiſhed from his functions; the one regard his character, the other his perſon.

Function, in *Analyſis*. The function of any quantity, as x, is any algebraic expreſſion of calculation into which x enters, mixed with other quantities that have invariable values; thus $\frac{1}{1+x}$, $(1+x^2)$, $(1+x)^3$, $(1+bx)^m \log. x$, &c. are all expreſſions which may be called functions of x: x is here ſuppoſed to be a variable quantity, and the object of the theory of analytic functions is to inveſtigate rules and proceſſes for determining in what manner certain variations of the quantity x will affect the values of the expreſſions, which, like the above, are functions of x.

Though the theory of analytic functions is ſo comprehenſive as to embrace the whole doctrine of variable quantities, or magnitudes, of what nature ſoever, yet it is nothing more than a continuation or branch of common algebra. It requires no new hypotheſis, but derives all its rules from the nature of the ſymbolical language adopted in that ſcience, and from the ſignification which by convention has been given to various analytical expreſſions. In its application to the inveſtigation of problems, it is analogous to the differential or fluxional calculus, but free from the objection ſo often urged againſt thoſe methods. Principles derived from the doctrine of bodies in motion, when applied to the inveſtigation of ſimple analytical expreſſions, ſeem evidently very remote from the ſubject in queſtion, and from that circumſtance alone we might very reaſonably be induced to ſuſpect the exiſtence of ſome other more appropriate method.

Surely it cannot be neceſſary to have recourſe to mechanical principles to ſhew what is the product of $a + x$ multiplied by $a + x$ a certain number of times, yet this is continually done by writers on fluxions, when they attempt to demonſtrate the binomial theorem by proceſſes derived from the principles of motion. It may ſometimes however happen that we are guided in our path to the diſcovery of general principles, from reflecting on the circumſtances which take place in partial inſtances. This has been the caſe in the doctrine of fluxions. The relation between the time employed and the ſpace deſcribed by a body in motion has given riſe to our idea of velocity; and from conſiderations drawn from theſe particular variable quantities, ſome principles have been deviſed, which it appears are applicable to variable quantities in general; yet the more logical method would certainly have been, firſt to have eſtabliſhed the law of variable magnitudes generally, and then to have ſhewn their application to the particular caſe of a body in motion.

It was a celebrated mathematician of our own country, Landen, who firſt propoſed to treat the fluxionary calculus as a branch of common algebra, but the method which he propoſes to ſubſtitute for it, is not only ſomewhat objectionable in its principle, but very incommodious in its practical application.

In the year 1772, M. Lagrange, in the Memoirs of the Academy of Berlin, firſt undertook to explain in what manner the fluxionary or differential calculus was included in the theory of the expanſion, in a ſeries of analytic functions. This celebrated work, entitled "Théorie des Fonctions Analytiques," appeared in 1796; it has ſince been illuſtrated and extended in another publication, "Leçons ſur le Calcul des Fonctions," 1806.

In theſe works the reader will find the whole theory of variable quantities completely developed, and applied to a great variety of important inveſtigations. Though we have no book in our own language which treats this ſubject on ſo extenſive a ſcale, yet the theory and principles on which the whole of this calculus depends, have been moſt ably explained by R. Woodhouſe, eſq. F.R.S. of Cambridge, in his "Principles of Analytical Calculation," a work which, for clearneſs, elegance, and perſpicuity, will probably for a long time remain unrivalled, and can never be excelled.

It is from theſe publications, and particularly the laſt, that the preſent abſtract is profeſſedly compoſed. But to enable the reader to comprehend the object propoſed, we ſhall endeavour to illuſtrate it by ſome very eaſy and ſimple examples.

Suppoſe $y = a x$, x being a variable quantity, y is then ſaid to be a function of x, ſince it depends on x for its value. If x aſſumes a new value, and becomes $x + \Delta x$ (Δx expreſſing the increment of x) y will require a new value, expreſſed in like manner by $y + \Delta y$. In this caſe we ſee immediately how the propoſed alteration in the value of x will affect the value of y; for ſubſtitute $x + \Delta x$ for x in the expreſſion $a x$, and it becomes $a x + a . \Delta x$. Therefore

$$y + \Delta y = a x + a . \Delta x;$$

and $$\Delta y = a . \Delta x.$$

It appears, therefore, that in the above equation, $y = a x$, if any variation is made in the value of x, the correſponding alteration in the value of y is a times as great.

Again, ſuppoſe $y = x^3$;
let x become $x + \Delta x$; then

$$y + \Delta y = x^3 + 3 x^2 . \Delta x + 3 x . (\Delta x)^2 + (\Delta x)^3$$

and $$\Delta y = 3 x^2 . \Delta x + 3 x . (\Delta x)^2 + (\Delta x)^3.$$

In the firſt of the above examples, Δy, or the new value of y, conſiſts of a ſingle term, namely, Δx with a co-efficient. In the ſecond example, Δy conſiſts of a ſeries of ſeveral terms, the firſt of which is Δx, with a certain co-efficient; the others contain regular aſcending powers of Δx, Δx^2, Δx^3, with their reſpective co-efficients.

It will be ſeen that it is under this form that Δy, or the new value of ϕx or y, may be moſt commonly obtained.

The object of reſearch is to find one or more terms, and ſometimes the whole of this ſeries, from the given relation between ϕx and x, and ſometimes the reverſe; or to find from one or more of theſe terms the original relation that ſubſiſted between ϕx and x. Theſe two methods, namely, the direct and reverſe, are analogous to the finding fluxions and fluents in the uſual fluxionary calculus.

If y be any function of $x = \phi x$, and its new value $y + \Delta y$ be obtained in the form of a ſeries aſcending according to the powers of Δx, then the firſt term of that ſeries, conſiſting of Δx and its co-efficient, is called the firſt derived function, or the differential of the variable quantity: it is the ſame as the fluxion of that quantity, but we do not obtain it in conſequence of any particular hypotheſis. The differential is only known to be the firſt term in conſequence of a previous definition, entirely arbitrary. The fluxion of a quantity is, on the contrary, obtained in conſequence of a particular theory; therefore, in whatever proceſs it is applied, that

that whole procefs becomes burthened with all the imperfections to which that original theory is liable. All this will be more diftinctly feen hereafter; what is faid at prefent is only to introduce the fubject, by apprifing the reader of the object of the fcience.

The notation we fhall adopt is the fame as that ufed by Mr. Woodhoufe, after M. D'Arbogaft. It differs materially from that of Lagrange.

Δ, denotes the entire difference,
d, the differential,
D, the differential co-efficient,
δ, the variation.

Thus, if $\overline{a+x}|^m$ be expanded, the co-efficient of the term involving x is always found by multiplying the index (m) of the firft term a^m, into that term, its index being diminifhed by unity: D, therefore, denotes this operation; hence $\mathrm{D}\,a^m$ fignifies $m\,a^{m-1}$, $\mathrm{D}\,a^{-m}$ fignifies $-m\,a^{-m-1}$, &c.

$\mathrm{D\,D\,D}\,a^m$, or $\mathrm{D}^3\,a^m$, denotes that three fimilar operations are to be made, the firft on a^m, the fecond on the power of a that refults after the firft operation, the third on the power of a, which remains after the fecond; hence $\mathrm{D}^3\,a^m$ fignifies $m\,\mathrm{D}^2\,a^{m-1}$, or $m\,.\,\overline{m-1}\,.\,\mathrm{D}\,a^{m-2}$, or $m\,.\,\overline{m-1}\,.\,\overline{m-2}\,.\,a^{m-3}$.

Similarly, $\mathrm{D\,D}......\mathrm{D}a^m$ (n D's and $n \angle m$) fignifies $m\,(m-1)\,(m-2).........(m-n+1)\,a^{m-n}$.

Or, if $\mathrm{D\,D\,D}.........\mathrm{D}\,(n)$ be abridgedly reprefented by D^n, $\mathrm{D}^n\,a^m$ fignifies $m\,(m-1)\,(m-2)...............(m-n+1)\,a^{m-n}$,

$\mathrm{D}^3\,a^3,\ 3\,.\,2\,.\,1\,a^0$; $\mathrm{D}^3 a^4,\ 4\,.\,3\,.\,2\,a$;

$\mathrm{D}^3\,1^m,\ m\,.\,(m-1)\,(m-2)\,1^{m-3}$;

$$\mathrm{D}^2\,1^{-\frac{1}{2}},\ -\frac{1}{2}\,.\,\frac{-3}{2}\,1^{-\frac{5}{2}}, \text{ or } \frac{3}{4}\,1^{-\frac{5}{2}}, \text{ or } \frac{3}{4};$$

$$\mathrm{D}^3\,1^{\frac{1}{3}},\ \frac{1}{3}\,.\,\frac{-2}{3}\,.\,\frac{-5}{3}\,1^{-\frac{8}{3}}, \text{ or } \frac{10}{27}\,1^{-\frac{8}{3}} \text{ or } \frac{10}{27};$$

$\mathrm{D}^2\,a^{-m},\ -m\,.\,\overline{-m-1}\,.\,a^{-m-2}$, or $m\,.\,(m+1)\,.\,a^{-(m+2)}$.

The propofition affumed by Lagrange, and which forms the bafis of his whole work, is this, that if $\varphi\,x$ be any function whatever of a variable quantity x, and x changes its value, and becomes $x+i$, then the $\varphi\,(x+i)$ may be reprefented or refolved into a feries of this form, $\varphi\,x + \mathrm{P}\,i + \mathrm{Q}\,i^2 + \mathrm{R}\,i^3$, &c. in which the co-efficients of the powers of i are new functions of x, derived from the primitive function x independent of i, and moreover, that every co-efficient is derived from the preceding one, in the fame manner as the firft is derived from the original function.

Could fuch a general propofition as this be fatisfactorily demonftrated, it would, no doubt, lead us at once a great way in the fcience. The binomial theorem, and other feries of frequent occurrence, would need no feparate inveftigation, but would follow as particular cafes of a general rule.

But Mr. Woodhoufe, in the work alluded to, has clearly fhewn that this affumption of Lagrange is much too general, and that no fuch theory of feries can be eftablifhed which fhall preclude the neceffity of any farther examination of particular forms. Now the function of x or $\varphi\,x$ comprehends, under its general fignification, a variety of combinations, fuch as x^m, a^x, log. x, fin. x, cof. x, &c. It feems, therefore, effentially neceffary in an elementary treatife to confider thefe forms, and to fhew in what manner, and with what reftrictions, they may be included under any general expreffion. The well-known binomial theorem we fhall take for granted, but not as a propofition derived from any abftract principle, but as the refult of inveftigation depending in great meafure on infpection and trial. (See Manning's Algebra.) Thofe authors who endeavour to give it a higher origin, as capable of being deduced from principles of motion, as in many treatifes on fluxions, feem to have been led into the error of fuppofing known what actually they were in fearch of. Inftances are to be found where the elementary rules of the fcience of fluxions are founded on the law of the binomial theorem, and that theorem afterwards demonftrated by the application of thofe very rules which could not themfelves have been devifed without the previous knowledge of the theorem to be inveftigated.

But, however this may be, let us at prefent take the truth of this theorem for granted, and proceed to a farther inveftigation of the fubject.

Note.—For the purpofe of a more commodious notation, $\underset{c}{\mathrm{D}^n}$ reprefents $\dfrac{\mathrm{D}^n}{1\,.\,2\,.\,3\,...\,n}$; $\underset{c}{\mathrm{D}^2} = \dfrac{\mathrm{D}^2}{1\,.\,2}$; $\underset{c}{\mathrm{D}^3} = \dfrac{\mathrm{D}^3}{1\,.\,2\,.\,3}$ &c.

$\overline{a+x}|^m$ being then affumed equal $a^m + \underset{c}{\mathrm{D}}\,a^m\,x + \underset{c}{\mathrm{D}^2}\,a^m\,x^2 + \underset{c}{\mathrm{D}^3}\,x^3$, &c. the next expreffion to be confidered is $\varphi\,x = a^x$.

Now, in the expreffion a^x there is nothing indicative of any operation that can be performed in a manner analogous to that of $\overline{a+x}|^n$, fome artifice muft be devifed to change its form for that purpofe; one of the moft fimple is, to make $1+b=a$, or a^x may be put under this form, $a^x = \underline{(1+(a-1))^x}$: then by the preceding theorem, where $a=1$, $x=a-1$, $m=x$, $a^x = (1+(a-1))^x = 1 + x$

$$(a-1) + \frac{x\,.\,(x-1)}{1\,.\,2}\,(a-1)^2$$

$$+\,x\,.\,\frac{(x-1)\,.\,(x-2)}{1\,.\,2\,.\,3}\,(a-1)^3, \text{ \&c. \&c.}$$

$= 1 + x\,((a-1) - \frac{1}{2}\,(a-1)^2 + \frac{1}{3}\,(a-1)^3 - \frac{1}{4}\,(a-1)^4$...or $\mathrm{A}\,x$

$$+\,\frac{x^2}{1\,.\,2}\,((a-1)^2 - (a-1)^3 + (a-1)^4\text{..........}\mathrm{A}_{,}\,x^2$$

$= 1 + \mathrm{A}\,x + \mathrm{A}_{,}\,x^2 + \mathrm{A}_{,,}\,x^3$;

in which feries the quantities A, $\mathrm{A}_{,}$, $\mathrm{A}_{,,}$, $\mathrm{A}_{,,,}$, are conftant co-efficients, but unknown. To determine the law of their connexion or dependance on each other, increafe x by the indeterminate quantity z;

then $a^{x+z} = 1 + \mathrm{A}\,(x+z) + \mathrm{A}_{,}\,(x+z)^2 ...\mathrm{A}_{n-1}\,(x+z)^n$;

or expanding the powers of $x+z$, ftopping at the two firft terms

$a^{x+z} = 1 + \mathrm{A}\,(x+z) + \mathrm{A}_{,}\,(x^2 + 2\,x\,z + \text{\&c.}) + \mathrm{A}_{,,}\,(x^3 + 3\,x^2\,z + \text{\&c.})$

$\mathrm{A}_{n-1}\,(x^n + n\,x^{n-1}z + \text{\&c.}) + \mathrm{A}_n\,(x^{n+1} + (n+1)\,x^n\,z + \text{\&c.})$

Again, $a^{x+z} = a^x\,a^z = (1 + \mathrm{A}\,x + \mathrm{A}_{,}\,x^2 ...\mathrm{A}_{n-1}\,x^n + \text{\&c.})$
$\times\,(1 + \mathrm{A}\,z + \mathrm{A}_{,}\,z^2 ...\mathrm{A}_{n-1}\,z^n + \text{\&c.})$
$= 1 + \mathrm{A}\,(x+z) + \mathrm{A}_{,}\,x^2 + \mathrm{A}_{,,}\,z^3 ...... + \mathrm{A}_{n-1}\,x^n$
$+\,\mathrm{A}^2 x\,z + \mathrm{A}_{,}\,\mathrm{A}\,.\,x^2 z ... + \mathrm{A}_{n-2}\,.\,\mathrm{A}\,x^{n-1}z$.

Compare the correfponding terms in the two expanfions, and

$2\,\mathrm{A}_{,} = \mathrm{A}^2$, and $\mathrm{A}_{,} = \dfrac{\mathrm{A}^2}{2}$, $3\,\mathrm{A}_{,,} = \mathrm{A}\,\mathrm{A}_{,} = \dfrac{\mathrm{A}^3}{2}$, and $\mathrm{A}_{,,} = \dfrac{\mathrm{A}^3}{1\,.\,2\,.\,3}$ $n\,\mathrm{A}_{n-1} = \mathrm{A}_{n-2}\,.\,\mathrm{A}$ or $\mathrm{A}_{n-1} = \dfrac{\mathrm{A}_{n-2}\,\mathrm{A}}{n} = \dfrac{\mathrm{A}^n}{1\,.\,2\,.\,3\,.\,4}$

$$\text{Hence, } a^x = 1 + \mathrm{A}\,x + \frac{\mathrm{A}^2\,.\,x^2}{1\,.\,2} + \frac{\mathrm{A}^3\,x^3}{1\,.\,2\,.\,3} + \frac{\mathrm{A}^4\,x^4}{1\,.\,2\,.\,3\,.\,4}$$

If $x = 1$ ... $a =$

$$x = 1 + A + \frac{A^2}{1.2} + \frac{A^3}{1.2.3} + \&c.$$

If $x = \frac{1}{A}$

$a^{\frac{1}{A}} = 1 + 1 + \frac{1}{1.2} + \frac{1}{1.2.3} + \&c. = 2.718281824,$

and when $A = 1 . a = 1 + 1 + \frac{1}{1.2} + \frac{1}{1.2.3} =$

$2.71828\,1824 = e$, suppose therefore $a^{\frac{1}{A}} = e$, and $a = e^A$,

then $e^x = 1 + x + \frac{x^2}{1.2} + \frac{x^3}{1.2.3} + \frac{x^4}{1.2.3.4}$;

x is here supposed variable; let the difference between it and its successive value be expressed by the symbol Δx......

then $e^{\Delta x} = 1 + \Delta x + \frac{(\Delta x)^2}{1.2} + \frac{(\Delta x)^3}{1.2.3} + \&c.$

$e^{x+\Delta x} = e^x + e^x \Delta x + \frac{e^x (\Delta x)^2}{1.2} + \frac{e^x (\Delta x)^3}{1.2.3} + \&c.$

Since $e^{-x} = 1 - x + \frac{x^2}{1.2} - \frac{x^3}{1.2.3}$ &c.

$e^x + e^{-x} = 2 + \frac{2x^2}{1.2} + \frac{2x^4}{1.2.3.4}$;

or $\frac{e^x + e^{-x}}{2} = 1 + \frac{x^2}{1.2} + \frac{x^4}{1.2.3.4} + \frac{x^6}{1.2.3.4.5.6} + \&c.$

and $\frac{e^x - e^{-x}}{2} = x + \frac{x^3}{1.2.3} + \frac{x^5}{1.2.3.4.5} + \frac{x^7}{1.2.3.4.5.6.7}$ + &c.

Again $e^{x+\Delta x} + e^{-(x+\Delta x)} = (e^x - e^{-x}) + (e^x - e^{-x})\,\Delta x + (e^x + e^{-x}) . \frac{(\Delta x)^2}{1.2} + \&c.$

And $e^{x+\Delta x} - e^{-(x+\Delta x)} = (e^x - e^{-x}) + (e^x + e^{-x})\,\Delta x + (e^x - e^{-x}) . \frac{(\Delta x)^2}{1.2}$.

In the form for e^x for x substitute $\pm x\sqrt{-1}$, then the symbol $e^{x\sqrt{-1}}$ represents $1 + x\sqrt{-1} - \frac{x^2}{1.2} - \frac{x^3\sqrt{-1}}{1.2.3}$ &c

and $e^{-x\sqrt{-1}}$ represents $1 - x\sqrt{-1} - \frac{x^2}{1.2} + \frac{x^3\sqrt{-1}}{1.2.3}$ — &c.

and consequently $\frac{e^{x\sqrt{-1}} + e^{-x\sqrt{-1}}}{2}$ is the symbol for $1 - \frac{x^2}{1.2} + \frac{x^4}{1.2.3.4}$ — &c.

and $\frac{e^{x\sqrt{-1}} - e^{-x\sqrt{-1}}}{2\sqrt{-1}}$ is the symbol for $x - \frac{x^3}{1.2.3} + \frac{x^5}{1.2.3.4.5}$ — &c,

again $e^{x\sqrt{-1}} \times e^{\Delta x\sqrt{-1}} = e^{x\sqrt{-1}} . \Delta x\sqrt{-1} - \frac{e^{x\sqrt{-1}}(\Delta x)^2}{1.2}$ — &c.

$e^{-x\sqrt{-1}} \times e^{-\Delta x\sqrt{-1}} = e^{-x\sqrt{-1}} - e^{-x\sqrt{-1}} . \Delta x\sqrt{-1} - \frac{e^{-x\sqrt{-1}}(\Delta x)^2}{1.2} + \&c.$

$\therefore \frac{e^{(x+\Delta x)\sqrt{-1}} + e^{-(x+\Delta x)\sqrt{-1}}}{2} = \frac{e^{x\sqrt{-1}} + e^{-x\sqrt{-1}}}{2} + \frac{e^{x\sqrt{-1}} - e^{-x\sqrt{-1}}}{2} . \Delta x\sqrt{-1} - \frac{e^{x\sqrt{-1}} + e^{-x\sqrt{-1}}}{1.2} (\Delta x) + \&c.$

The form for a^x being determined, suppose it were required to determine X in terms of x; in this equation $x = a^X$. Since $x = a^X$, $x^z = a^{Xz}$ (z being an independent arbitrary quantity,) consequently from the last article, if $(x-1) - \frac{1}{2}(x-1)^2 + \frac{1}{3}(x-1)^3$ — &c. be put $= V$;

then $1 + Vz + \frac{(Vz)^2}{1.2} + \frac{(Vz)^3}{1.2.3} + \&c.$

$= 1 + AXz + \frac{(AXz)^2}{1.2} + \frac{(AXz)^3}{1.2.3}$, &c. Hence comparing the co-efficients affected with the same powers of z

$V = AX$ or $X = \frac{V}{A} = \frac{(x-1) - \frac{1}{2}(x-1)^2 + \frac{1}{3}(x-1)^3 - \&c.}{A}$

$$= \frac{(x-1) - \frac{1}{2}(x-1)^2 + \frac{1}{3}(x-1)^3 - \&c.}{(a-1) - \frac{1}{2}(a-1)^2 + \frac{1}{3}(a-1)^3 - \&c.}$$

Hence, if equations, as $x = a^X$, $1 + x = a^X$, &c. be thus denoted,

$x = a^{\phi x}$, $1 + x = a^{\phi(1+x)}$, we have

$$\phi(1+x) = \frac{x - \frac{x^2}{2} + \frac{x^3}{3} - \&c.}{A}$$

In like manner $\phi\left(1 + \frac{\Delta x}{x}\right)$

$$= \frac{\frac{\Delta x}{x} - \frac{1}{2}\left(\frac{\Delta x}{x}\right)^2 + \frac{1}{3}\left(\frac{\Delta x}{x}\right)^3 - \&c.}{A}$$

And since $x + \Delta x = x + \left(1 + \frac{\Delta x}{x}\right)$, $a^{\phi(x+\Delta x)} = a^{\phi x} \times a^{\phi(1+\Delta x)}$.

Therefore $\phi(x + \Delta x) = \phi x + \phi\left(1 + \frac{\Delta x}{x}\right)$,

or $\phi(x+\Delta x) = \phi x + \frac{\frac{\Delta x}{x} - \frac{1}{2}\left(\frac{\Delta x}{x}\right)^2 + \frac{1}{3}\left(\frac{\Delta x}{x}\right)^3 - \&c.}{A}$

If $x = a^{\phi x}$, $x^{\frac{1}{2}} = a^{\frac{\phi x}{2}}$, $x^{\frac{1}{3}} = a^{\frac{\phi x}{3}}$, &c.

and generally $x^{\frac{1}{m}} = a^{\frac{\phi x}{m}}$; then

$\phi x = \frac{2}{A}\left((x^{\frac{1}{2}} - 1) - \frac{1}{2}(x^{\frac{1}{2}} - 1)^2 + \frac{1}{3}(x^{\frac{1}{2}} - 1)^3 - \&c.\right)$

or $= \frac{3}{A}\left((x^{\frac{1}{3}} - 1) - \frac{1}{2}(x^{\frac{1}{3}} - 1)^2 + \frac{1}{3}(x^{\frac{1}{3}} - 1)^3 - \&c.\right)$

or generally $= \frac{m}{A}\left((x^{\frac{1}{m}} - 1) - \frac{1}{2}(x^{\frac{1}{m}} - 1)^2 + \frac{1}{3}(x^{\frac{1}{m}} - 1)^3 - \&c.\right)$

In the equation $x = a^X$, or $= a^{\phi x}$, X or ϕx is called the logarithm of x, and a the base; if the value of a be such that A or $(a-1) - \frac{1}{2}(a-1)^2 + \frac{1}{3}(a-1)^3 - \&c. = 1$, representing this value of a by e $\left(= 1 + 1 + \frac{1}{1.2} + \frac{1}{1.2.3}\right.$

and

and = 2.718281824, &c.); then in the equation $x = e^X$ or $e^{\phi x}$, X or ϕx is commonly called the hyperbolic logarithm, becaufe it can be reprefented by the area of an equilateral hyperbola between its afymptotes: the name, however, is improperly given, fince the connection between the theories of curve lines and logarithms is merely arbitrary and accidental.

It has appeared that

$$(x + \Delta x)^m = x^m + m x^{m-1} . \Delta x + \frac{m . (m-1)}{2}, x^{m-2} (\Delta x)^2 + \&c.$$

$$= x^m + D x^m . \Delta x + \underset{c}{D^2} x^m (\Delta x)^2 + \&c.$$

Likewife that $a^{x+\Delta x} = a^x . A . \Delta x + \frac{a^x . A^2 (\Delta x)^2}{1 . 2}, \&c.$

$$e^{x+\Delta x} = e^x + e^x \Delta x + \frac{e^x (\Delta x)^2}{1 . 2} + \&c.$$

and that in the equations $x + \Delta x = a^{L.(x+\Delta x)}$, $x + \Delta x = e^{l(x+\Delta x)}$;

$$L . (x + \Delta x) = L . x + \frac{1}{A} . \left(\frac{\Delta x}{x}\right) - \frac{1}{2}\left(\frac{\Delta x}{x}\right) + \frac{1}{3}\left(\frac{\Delta x}{x}\right)^3 - \&c.;)$$

$$l (x + \Delta x) = l . x . + \frac{\Delta x}{x} - \frac{1}{2}\left(\frac{\Delta x}{x}\right)^2 + \frac{1}{3}\left(\frac{\Delta x}{x}\right)^3 - \&c.$$

In the above expreffions $L . x$ denotes the common, and $l . x$ the Napierean or hyperbolic logarithm of x.

Of the expanfions of the forms x^m, a^x, e^x, $l . x$, when x is increafed to $(x + \Delta x)$, it appears then, that there are certain common properties which can be predicated, and it becomes an object of analytic concern to defignate thefe expreffions x^m, e^x, &c. by a common fymbol and name, and to comprehend their expanfions under a general formula. The advantage of this generalization is fufficiently obvious (if it can be effected,) fince it will enable us to announce generally and concifely what otherwife we muft announce tedioufly, by enumerating particular cafes.

The expreffions x^m, a^x, $l . x$, are called functions of x, and are thus fymbolically reprefented by $F x$, ϕx, $f x$, or ψx, &c; and confequently $F (x + \Delta x)$ or $\phi (x + \Delta x)$ or $f (x + \Delta x)$, $\psi (x + \Delta x)$, &c. mean either $(x + \Delta x)^m$, $a^{(x+\Delta x)}$, or $l (x + \Delta x)$.

Now the fymbol D has hitherto only denoted that operation by which the co-efficient of the fecond term in the expanfion of $(a + x)^m$ or $(x + \Delta x)^m$ is formed. Let it now be made to denote the operation made on x^m, a^x, $l . x$, &c. by which the co-efficient of the fecond term, in the expanfions of $(x + \Delta x)^m$ $(a^{x+\Delta x})$, $L . (x + \Delta x)$ $(x + \Delta x = a^{L(x+\Delta x)})$ is formed then under this fignification; its former one will be comprehended, but it will no longer denote a fimilar operation, as when reftricted to expreffions fuch as x^m; D, however, when applied to ϕx, generally reprefents the fecond term of the feries that arifes from expanding ϕx, when for x we fubftitute its new value $x + \Delta x$; and that fecond term can always be known, fince all the expreffions which $\phi (x + \Delta x)$ is made generally to reprefent, have been previoufly expanded.

Thus, $D x^m = m x^{m-1}$,

$D a^x = A a^x$, $D e^x = e^x$

$D L . x = \frac{1}{A x}$ $D . l . x = \frac{1}{x}$.

Hence D D x^m or $D^2 x^m$ denotes $m . (m-1) x^{m-2}$,
D D a^x or $D^2 a^x$ denotes D $(A a^x)$ or $A^2 a^x$,
D D D a^x or $D^3 a^x$ denotes $A^3 a^x$.

Again, D D $l . x$ or $D^2 l . x$ denotes $D \frac{1}{x}$ or $- \frac{1}{x^2}$,

D D D or $D^3 . l . x$ denotes $D (D^2 l . x)$ or $D \left(\frac{1}{x^2}\right)$ or $\frac{2}{x^3}$.

In like manner $D^4 l . x$ denotes $D (D^3 l . x)$ or $- \frac{2 . 3}{x^4}$.

Hence, fince

$$(x + \Delta x)^m = x^m + m x^{m-1} \Delta x + \&c.$$

$$a^{x+\Delta x} = a^x + A a^x . \Delta x + \frac{A^2 a^x (\Delta x)^2}{1 . 2} + \&c.$$

$$L . (x + \Delta x) = L . x + \frac{\Delta x}{A x} + \frac{(\Delta x)^2}{2 . A . x^2} + \&c.$$

and $l (x + \Delta x) = l . x + \frac{\Delta x}{x} - \frac{1}{2}\left(\frac{\Delta x}{x}\right)^2 + \&c.$

It appears that all thefe forms may be comprehended under the following:

$$\phi (x + \Delta x) = \phi x + D \phi x . \Delta x + \underset{c}{D^2} \phi x (\Delta x)^2 + \&c.$$

$$\text{or} = \phi x + D \phi x . \Delta x + \frac{D \phi x (\Delta x)^2}{1 . 2} + \&c.$$

which agrees with the theorem known by the name of Taylor's theorem, and given by that learned mathematician in his "Methodus Incrementorum," wherein he fays that z flowing uniformly and becoming $z + v$, x becomes

$$x + \dot{x} . \frac{v}{1} \dot{z} + \ddot{x} . \frac{v^2}{1 . 2} \dot{z}^2 + \dddot{x} . \frac{v^3}{1 . 2 . 3} \dot{z}^3 + \&c.$$

The co-efficients of the fecond, third, &c. terms, are reprefented by $D \phi x$, $\underset{c}{D^2} \phi x$, $\underset{c}{D^3} \phi x$, &c.; and when ϕx is of the form $l . x$, $(x = e^{l . x})$ then the firft term is $l . x$, and the co-efficient of the fecond is $\frac{1}{x}$; but $- \frac{1}{x^2}$, the co-efficient of the third term, is not formed from $\frac{1}{x}$ as $\frac{1}{x}$ is from $l . x$.

When $D \phi x$, $D^2 \phi x$, &c. are faid to be derived from each other by the fame law, it fhould always be previoufly defined, that by the fame law is meant that which orders the fecond term of the feries to be taken when the function of x, whatever it is, has been expanded after fubftituting $x + \Delta x$ for x.

Since $a^{\pm(x+\Delta x)}$ or $e^{\pm(x+\Delta x)}$ will likewife be included under the form $\phi (x + \Delta x) = \phi x + D \phi x . \Delta x + \underset{c}{D^2} \phi x (\Delta x)^2 + \&c.$ it is clear that if $\phi (x)$ be made to reprefent $e^x \pm e^{-x}$, that $e^{x+\Delta x} \pm e^{-(x+\Delta x)}$ will likewife be included under the above form $\phi (x + \Delta x)$, and its expanfion likewife under the fame form as that of $\phi (x + \Delta x.)$

Again, if the fymbol $\sqrt{-1}$ be employed, $e^{(\pm(x+\Delta x)\sqrt{-1})}$ may be included under the form $\phi (x + \Delta x = \phi x + D \phi x . \Delta x + \underset{c}{D^2} \phi x . (\Delta x)^2$, and confequently if ϕx be made to reprefent $e^{x\sqrt{-1}} \pm e^{-x\sqrt{-1}}$; then $e^{(x\Delta+x)\sqrt{-1}} \pm e^{-(x+\Delta x)\sqrt{-1}}$ will be included under the form $\phi (x + \Delta x) = \phi x + D \phi x . \Delta x + \underset{c}{D^2} \phi x . (\Delta x)^2 + \&c.$

The fymbols $2^{-1} (e^{x\sqrt{-1}} + e^{-x\sqrt{-1}})$; $(2 \sqrt{-1})^{-1} (e^{x\sqrt{-1}} - e^{-x\sqrt{-1}})$ reprefent the cofine and fine of an arc x, whofe radius is unity, and confequently with reference to their

their analytica representation, the expressions cos. $(x + \Delta x)$, sin. $(x + \Delta x)$ expanded may be said to be included under the form $\phi(x + \Delta x) = \phi x + D\phi x(\Delta x. + \frac{D^2}{c}\phi x(\Delta x)^2 + \&c.$ But strictly there is no more reason for considering sin. x cos. x as a simple analytical function of x distinct from e^x, than for considering $e^x \pm e^{-x}$, or generally $e^{\alpha x} + e^{\beta x} + e^{\gamma x}$, &c. ($\alpha, \beta, \gamma$, &c. being roots of $x^n \pm 1 = 0$) as functions of x distinct from e^x.

On the nature of the above analytical expressions for the sine and cosine of an arc x, the reader is referred to a very learned paper in the Transactions of 1802 by Mr. Woodhouse, and likewise to the Treatise of Trigonometry by Le Gendre, p. 354. Since this article was written Mr. Woodhouse has published a Treatise on Trigonometry, to which the reader is referred.

The cases which Mr. Woodhouse next considers in his principles of analytical calculation are those of fractions, whose numerators and denominators under particular circumstances vanish. Let us take a simple case, that of $\frac{x^2 - a^2}{x - a}$; the signification of this expression is, that $x^2 - a^2$ is to be divided by $x - a$; the result of that division is $x + a$, or putting $x = a$, $a + a$, or $2a$. The result, however, is no direct and natural consequence from the principles of calculation. To the question, what does $\frac{x^2 - a^2}{x - a}$ become, when $x = a$; the obvious and logical answer is $\frac{a^2 - a^2}{a - a}$. And what would be the method of shewing that this value $\frac{a^2 - a^2}{a - a}$ was wrongly assigned? This, I apprehend; $x^2 - a^2 = (x - a)(x + a)$, $\therefore \frac{x^2 - a^2}{x - a} = \frac{(x - a)(x + a)}{(x - a)} = x + a = (x = a)$, $2a$; but herein is a manifest fallacy; $x^2 - a^2$ is not *generally* $= (x - a)(x + a)$: for instance, the particular case of $x = a$ is to be excluded; the proof essentially demanding this circumstance, to wit, that $x - a$ be a quantity, or that x be greater than a;

By the instances subjoined, it will more fully appear, that the values of vanishing fractions are arbitrarily obtained, that is, obtained by extending a rule, and observing a certain order in the process of calculation.

Suppose the fraction $\frac{\sqrt{x} - \sqrt{a} + \sqrt{(x - a)}}{\sqrt{(x^2 - a^2)}}$; for x, put $a + (x - a)$, then,

$$(a + x - a)^{\frac{1}{2}} = a^{\frac{1}{2}} + \frac{(x - a)}{2a^{\frac{1}{2}}} - \frac{(x - a)^2}{8a_{\frac{1}{2}}} + \&c.$$

$$\therefore \text{fraction} = \frac{(x - a)^{\frac{1}{2}} + \frac{(x - a)}{2a^{\frac{1}{2}}} - \frac{(x - a)^2}{8a^{\frac{1}{2}}} + \&c.}{(x^2 - a)^{\frac{1}{2}}}$$

$= \frac{1 + \frac{1}{2}\left(\frac{x - a}{a}\right)^{\frac{1}{2}} - \&c.}{(x + a)^{\frac{1}{2}}}$; in this part of the operation put $x = a$, and the expression is reduced to $\frac{1}{(2a)^{\frac{1}{2}}}$.

This result is the same as what the rules derived from the differential calculus give: and that the result is obtained arbitrarily, by artifice, and by observing in the process, an order not indicated in the expression, appears simply thus; instead of putting $a + (x - a)$ for x, put $(x - a) + a$, and $\sqrt{x}$ becomes $(x - a)^{\frac{1}{2}} + \frac{a}{2(x - a)^{\frac{1}{2}}} - \&c.$ by which method we could arrive at no finite conclusion, since putting $x = a$, the co-efficients of the terms of $(x - a + a)^{\frac{1}{2}}$ expanded, would be infinite: yet, without a particular purpose in view, the latter series is as true as the former; and, instead of x is substituted not $(x - a) + a$, but $a + (x - a)$, for the same reason, as $9^{\frac{1}{3}}$ would be put $(8 + 1)^{\frac{1}{3}}$, and not $(1 + 8)^{\frac{1}{3}}$, if it were required to compute $9^{\frac{1}{3}}$ by the binomial theorem.

Let now the fraction (F) be $\frac{(2r^3x - x^4)^{\frac{1}{2}} - (rx^2)^{\frac{1}{3}}}{r - (rx)^{\frac{1}{2}}}$ which is the instance given by Bernouilli, and subsequently by Landen in his Residual Analysis; the value of the fraction (F) is required when $x = r$;

$$\text{now } F = \frac{((r^3x + x(r^3 - x^3))^{\frac{1}{2}} - (rx^3)^{\frac{1}{2}}}{r^{\frac{1}{2}}(r^{\frac{1}{2}} - x^{\frac{1}{2}})}$$

$$= \frac{(r^3x)^{\frac{1}{2}} + \frac{x.(r^3 - x^3)}{2(r^3x)^{\frac{1}{2}}} + A(r^3 - x^3)^2 + \&c. - (rx^3)^{\frac{1}{2}}}{r^{\frac{1}{2}}(r^{\frac{1}{2}} - x^{\frac{1}{2}})}$$

(A the co-efficient of the third term)

$$= \frac{(rx)^{\frac{1}{2}} \times (r - x) + \frac{x(r^3 - x^3)}{2(r^3x)^{\frac{1}{2}}} + A(r^3 - x^3)^2 + \&c.}{r^{\frac{1}{2}}(r^{\frac{1}{2}} - x^{\frac{1}{2}})}$$

$$= \frac{(rx)^{\frac{1}{2}}.(r^{\frac{1}{2}} + x^{\frac{1}{2}}) + \frac{x^{\frac{1}{2}}}{2rr^{\frac{1}{2}}}(r^2 + rx + x^2).(r^{\frac{1}{2}} + x^{\frac{1}{2}}) + A.(r^3 - x^3) \times \&c. + \&c.}{r^{\frac{1}{2}}}$$

when $x = r$, $= r^{\frac{1}{2}}(r^{\frac{1}{2}} + r^{\frac{1}{2}}) + \frac{1}{2rr^{\frac{1}{2}}}(r^2 + r^2 + r^2)$

$$(r^{\frac{1}{2}} + r^{\frac{1}{2}}) = 2r + \frac{3r \times 2r}{2r} = 5r.$$

Again, let the fraction (F) be $\frac{(2a^3 + 2x^3)^{\frac{1}{2}} - 2a^{\frac{2}{3}}x^{\frac{1}{3}}}{x - a}$, an instance given by Euler; the value of this fraction is required, when $x = a$;

$$\text{now } F = \frac{2^{\frac{1}{2}}(2x^3 - (x^3 - a^3))^{\frac{1}{2}} - 2a^{\frac{2}{3}}x^{\frac{1}{3}}}{x - a}$$

$$= \frac{2^{\frac{1}{2}} \times \left(2^{\frac{1}{2}}x - \frac{x^3 - a^3}{2(2x^3)^{\frac{1}{2}}} + A(x^3 - a)^2 + \&c.\right) - 2a^2x^{\frac{1}{3}}}{x - a}$$

$$= \frac{2x^{\frac{1}{3}}(x^{\frac{2}{3}} - a^{\frac{2}{3}}) - \frac{x^3 - a^3}{2x} + A(x^3 - a)^2 + \&c.}{x - a}$$

$$= \frac{2x^{\frac{1}{3}}(x^{\frac{1}{3}} + a^{\frac{1}{3}})}{x^{\frac{2}{3}} + a^{\frac{1}{3}}x^{\frac{1}{3}} + a^{\frac{2}{3}}} - \frac{x + a}{2x} + A(x^3 - a^3)(x + a),$$

&c. $= (x = a)\ \frac{4}{3} - 1$ or $\frac{1}{3}$.

The simple rule for finding the value of these fractions is to take the differentials of the numerator and denominator:

Thus, in $F = \frac{x^2 - a^2}{x - a}$, $\frac{d(x^2 - a^2)}{d(x - a)} = 2x\,dx$,

$d(x-a) = dx \therefore F = \frac{2x\,dx}{dx} = 2x = 2a,$

again, in $F = \frac{\sqrt{(2a^3x - x^4)} - a^3\sqrt{a^2x}}{a - {}^4\sqrt{ax^3}} \left(\frac{N}{D}\right) d(N)$

$= \left\{ (a^3 - 2x^3)(2a^3x - x^4)^{-\frac{1}{2}} - \frac{1}{3}a^{\frac{2}{3}}x^{-\frac{2}{3}} \right\}$

$dx\,d(D) = -\frac{3}{4}a^{\frac{1}{4}}x^{-\frac{1}{4}}.dx$

when $x = a$, $d(N) = \left(-a^4.(a^4)^{\frac{1}{2}} - \frac{a}{3}\right)dx = -\frac{4a}{3}$

and $d(D) = -\frac{3}{4}.dx \therefore F = \frac{d(N)}{d(D)} = \frac{9a}{1b}.$

This rule is sufficient for the generality of cases; and the process continued will give the value of F; this continuation of the process is necessary when after the first differentiation, and the substitution of $x = a$, the numerator and denominator each $= 0$: an instance of this case is $\frac{a^3\sqrt{(4a^3 + 4x)} - ax - a^2}{\sqrt{(2a^2 + 2x^2)} - x - a}$.

If after the second differentiation, N and D each $= 0$, then continue the differentiation as long as N and D shall $= 0$.

Generally to find the value of $\frac{fx}{Fx}$, when fx, and Fx, $= 0$ on making $x = a$; for x substitute $a + (x - a)$, then $fx = f\big(a + (x - a)\big) = fa + Dfa.(x-a) + \underset{c}{D^2}fa.(x-a)^2 + \&c.$

and $Fx = F\big(a + (x-a)\big) = Fa + DFa(x-a) + \underset{c}{D^2}Fa(x-a)^2 + \&c.$

but when $x = a$, fx, Fx, or fa, $Fa = 0$,

$$\therefore \frac{fx}{Fx} = \frac{Dfa + \underset{c}{D^2}fa.(x-a) + \&c.}{DFa + \underset{c}{D^2}Fa(x-a) + \&c.}$$

$= (\text{putting } x = a),\ \frac{Dfa}{DFa}$, except Dfa, DFa likewise $= 0$, and then $\frac{fx}{Fx} = \frac{\underset{c}{D^2}fa + \underset{c}{D^3}fa.(x-a) + \&c.}{\underset{c}{D^2}Fa + \underset{c}{D^3}Fa(x-a) + \&c.}$

$= (\text{putting } x = a)\ \frac{\underset{c}{D^2}fa}{\underset{c}{D^2}Fa}$, and if $\underset{c}{D^2}fa$, $\underset{c}{D^2}Fa$ likewise $= 0$, then $\frac{fx}{Fx} = \frac{D^3fa}{DFa}$, and generally, if the terms of the expanded series up to the n^{th} terms, to wit, $\underset{c}{D^n}fa$, $\underset{c}{D^n}Fa$, $= 0$, then $\frac{fx}{Fx}(x = a) = \frac{D^nfa}{D^nFa}$.

This rule may be demonstrated thus:

Let $y = \frac{fx}{Fx} \therefore y.Fx = fx \therefore \frac{dy}{dx}.Fx + \frac{dFx}{dx} = \frac{d.fx}{dx}$

but when $x = a$, by hypothesis $Fx = 0$,

$$\therefore y = \frac{dFx}{dx} = \frac{dfx}{dx},\ \text{or}\ y = \frac{D.fx}{D.Fx}$$

which is the first part of the rule.

If when $Fx = 0$, DFx, $DFx = 0$ also; then by taking the differential of equation (1)

$\frac{d^2y}{dx^2}.Fx + \frac{2dy}{dx}.D.Fx + yD^2.Fx = D^2.fx$;

but when $x = a$, Fx, DFx, $= 0$ or $y = \frac{D^2fx}{D^2Fx}$, which is the proof of the second part of the rule 1, or of the process continued.

The values then of fractions, such as $\frac{fx}{Fx}$, whose numerators and denominators vanish, on assigning particular values to x, may be computed by the preceding process: which process is arbitrary, and not necessarily to be followed, from any thing contained in the significancy of the expression $\left(\frac{fx}{Fx}\right)$. Propose the question separately, what does $\frac{x^m - a^m}{x^n - a^n}$ become $x = a$? and the obvious answer to any mind undebauched with mathematical sophistry, is $\frac{a^m - a^m}{a^n - a^n}$ or $\frac{0}{0}$. A different result can be obtained by a different process: but why ought that process to be followed? No satisfactory answer can be given to this question, when it is abstractedly proposed to find the value of $\frac{fx}{Fx}$, and we can only remove our doubts by viewing the circumstances under which, in the application of analysis, it is necessary to compute $\frac{fx}{Fx}$.

Now the fact is, that in investigating the properties of extension, or of motion, the nature of the case directs us to follow, in computing the value of a vanishing fraction, a process exactly similar to that by which $\frac{fx}{Fx}$ has been computed; thus, if y be the ordinate of a curve, and $= \frac{x^2}{b}$, and y' be another ordinate, at an interval $(x' - x)$, and $= \frac{x'^2}{b}$, then $\frac{\text{ordinate}}{L}$ (L being a part of the axis intercepted between the points where the ordinate and a secant of the curve cut the axis) $= \frac{1}{b}\left(\frac{x'^2 - x^2}{x' - x}\right) = \frac{1}{b}(x' + x)$.

Here x' is greater than x, and the line L approaches more nearly to the value of the subtangent, the nearer the points of intersection are, or the less the difference is between x' and x; and the tangent being, what the secant becomes, when the two points of intersection unite, the value of $\frac{\text{ordinate}}{\text{subtangent}}$ is expressed by the limit of $\frac{1}{b}\left(\frac{x'^2 - x^2}{x' - x}\right)$, or by what $\frac{1}{b}(x' + x)$ becomes, when $x' = x$, or by $\frac{2x}{b}$.

Hence, too, it appears, why in finding the value of $\frac{fx}{Fx}$, $a + (x - a)$, is put for x and not $(x - a)$: for since, in finding the subtangent or velocity, an expression is required near to the truth, and which approaches to it the more nearly, the less is the interval between x and a (or x' and x), it is necessary to expand $\frac{fx}{Fx}$ by a series that converges, and it is plain that $f\big((x-a) + a\big)$ is the symbol of a diverging, and $f\big(a + (x-a)\big)$ of a converging series.

These vanishing fractions have caused many discussions amongst mathematicians; they have caused many false

2 reasonings.

reasonings. It was not perceived that, to assign the value of $\frac{x^m - a^m}{x^n - a^n}$ $(x = a)$, there was an absolute necessity of some definition, convention, or extension. The notion of an inherent signification, and of an essential value, belonging to such an expression, as $\frac{x^m - a^m}{x^n - a^n}$, bewildered men who valued themselves on the clearness of their apprehension, and the justness of their inferences.

The method of limits, or of prime and ultimate ratios, Landen's method, the method of finding the value of $\frac{f\,x}{F\,x}$ $(f\,x,\ F\,x = 0)$ are related methods: they all demand the same arbitrary assumption, which has never been expressly made; they are all equally subject to an objection, which has never been satisfactorily removed.

Such is the theory of these quantities as given by Mr. Woodhouse, and which is so clear and satisfactory as to supersede the necessity of any further investigation.

It has been shewn that if $\phi\,x$ denote a simple analytical function of x, $\phi\,(x + \Delta\,x)$ expanded may be expressed by this formula, $\phi\,x + D\,\phi\,x \cdot \Delta\,x + \frac{D^2}{c}\phi\,x\,(\Delta\,x)^2 +$ &c.; D being the note of an operation by which the co-efficient of the second term of the expanded expression is obtained; thus if $\phi\,x$ respectively represents x^m, a^x, e, $l\,.\,x$; $D\,\phi\,x$ represents $m\,x^{m-1}$, $A\,a^x$, e^x, $\frac{1}{x}$; now in the expanded expression of $\phi\,(x + \Delta\,x)$, for $\Delta\,x$ put the symbol $d\,x$, then $\phi\,(x + d\,x) = \phi\,x + D\,\phi\,x\,.\,d\,x + \frac{D^2}{c}\phi\,x\,.\,(d\,x)^2 +$ &c. and let d denote that operation by which the second term of $\phi\,(x + d\,x)$ is found, in which case it must also denote the first term of the entire difference of $\phi\,(x + d\,x)$ and $\phi\,x$. Hence $d\,.\,\phi\,x = D\,\phi\,x\,.\,d\,x$, consequently $D\,\phi\,x = \frac{d\,\phi\,x}{d\,x}$; again $d\,(d\,\phi\,x)$ = first term of $\big(D\,\phi\,(x + d\,x) - D\,\phi\,x\big)$, $d\,x$ expanded $= D^2\phi\,x\,.\,(d\,x)^2$, consequently $D^2\phi\,x = \frac{d\,.\,(d\,\phi\,x)}{(d\,x)^2} = \frac{d^2\,\phi\,x}{d\,x^2}$ (employing $d\,x^2$, $d\,x^3 \ldots\ldots d\,x^n$ to represent $(d\,x)^2$ $\big((d\,x)^3 \ldots\ldots (d\,x)^n\big)$; again $d\,(d^2\,\phi\,x)$ or $d^3\,\phi\,x = D\,(d^2\,\phi\,x)\,d\,x = D\,(D^2\,\phi\,x\,.\,d\,x^2)\,.\,d\,x = D^3\,\phi\,x\,.\,d\,x^3$; consequently $D^3\,\phi\,x = \frac{d^3\,\phi\,x}{d\,x^3}$; and generally $D^n\,\phi\,x = \frac{d^n\,\phi\,x}{d\,x^n}$. The expanded form for $\phi\,(x + \Delta\,x)$ may then be thus represented;

$$\phi\,x + \frac{d\,\phi\,x}{d\,x}\,.\,\Delta\,x + \frac{\frac{d^2}{c}\,\phi\,x}{d\,x^2}\,.\,(\Delta\,x)^2 + \text{\&c.}$$

and similarly

$$\phi\,(x + d\,x) = \phi\,x + \frac{d\,\phi\,x}{d\,x}\,.\,d\,x + \frac{\frac{d^2}{c}\,\phi\,x}{d\,x^2}\,.\,d\,x^2 + \text{\&c.}$$

The difference between $\phi\,(x + d\,x)$ and $\phi\,x$ is called the *entire difference*, and its note or symbol is Δ; thus $\Delta\,\phi\,x$ or $\phi\,(x + d\,x) - \phi\,x = \frac{d\,\phi\,x}{d\,x}\,.\,d\,x + \frac{\frac{d^2}{c}\,\phi\,x}{d\,x^2} +$ &c. A part of this entire difference, *viz.* the second term, is called the *differential*, and its note or symbol is d; thus $d\,(\phi\,x) = \frac{d\,\phi\,x}{d\,x}\,.\,d\,x$, or $D\,\phi\,x\,.\,d\,x$; the second, third, &c. *n*th terms of the series for $\Delta\,\phi\,x$ (abstracting the numerical part of the co-efficients) are called the 2d, 3d, &c. *n*th differentials; thus,

$$\Delta\,\phi\,x = \frac{d\,\phi\,x}{d\,x}\,.\,d\,x + \frac{d^2\,\phi\,x}{1\,.\,2\,.\,d\,x^2}\,.\,d\,x^2 + \frac{d^3\,\phi\,x}{1\,.\,2\,.\,3\,.\,d\,x^3}\,.\,d\,x^3$$

+ &c. and $\frac{\frac{d^2}{c}\,\phi\,x}{d\,x^2}\,.\,d\,x^2$, $\frac{\frac{d^3}{c}\,\phi\,x}{d\,x^3}\,.\,d\,x^3$ &c. $\frac{\frac{d^n}{c}\,\phi\,x}{d\,x^n}\,.\,d\,x^n$ are the second, third, *n*th, &c. differentials.

Since Δ is the note of the entire difference, and d of the first term of that difference, when these notes are applied to a simple quantity, as x, they are equally significant; thus $\Delta\,x = d\,x$. $\frac{d\,\phi\,x}{d\,x}$, $\frac{d^2\,\phi\,x}{d\,x^2}$, &c. are to be considered as types of calculation; thus $\frac{d\,\phi\,x}{d\,x}$ denotes, that in $\phi\,x$, for x, $x + d\,x$ is to be put, and the co-efficient of the second term of $\phi\,(x + d\,x)$ expanded to be taken; $\frac{d\,\phi\,x}{d\,x}$, $\frac{d^2\,\phi\,x}{d\,x^2}$, &c. are called the differential co-efficients.

A few instances will shew the signification of the symbols Δ, D, d;

$$\Delta\,x^m = m\,x^{m-1}\,.\,\Delta\,x + \frac{m\,.\,(m-1)}{1\,.\,2}\,x^{m-2}\,.\,(\Delta\,x)^2 + \text{\&c.}$$

when $\Delta\,x^m = (x + \Delta\,x)^m - x^m$, or $= m\,x^{m-1}\,.\,d\,x + \frac{m\,.\,(m-1)}{1\,.\,2}\,x^{m-2}\,.\,d\,x^2 +$ &c.

when $\Delta\,x^m = (x + d\,x)^m - x^m$;

$D\,x^m = m\,x^{m-1}$, since $D\,x^m$ denotes the second term of $(x + 1)^m$ expanded, to be taken

$d\,(x^m) = m\,x^{m-1}\,d\,x$; x^m is included within brackets to prevent ambiguity, since $d\,x^m$ has already been used to denote $(d\,x)^m$.

Again, if $x + \Delta\,x$ be put for x, $\Delta\,a^x = A\,a^x\,.\,\Delta\,x + \frac{A^2\,a^x}{1\,.\,2}\,.\,(\Delta\,x)^2 +$ &c.;

if $x + d\,x$ be put for x, $\Delta\,a^x = A\,a^x\,.\,d\,x + \frac{A^2\,a^x}{1\,.\,2}\,.\,(d\,x)^2$ + &c.

$D\,a^x =$ (second term of a^{x+1} expanded) $= A\,a^x$, $d\,(a^x) = A\,a^x\,.\,d\,x$, and $d\,(e^x) = e^x\,.\,d\,x$.

Again, $l\,.\,x$ being dependant on the equation $x = e^{l\,.\,x}$, $\Delta\,l\,.\,x =$ (the difference between two successive values of x being $\Delta\,x$)

$$\frac{\Delta\,x}{x} - \tfrac{1}{2}\,.\left(\frac{\Delta\,x}{x}\right)^2 + \tfrac{1}{3}\,.\left(\frac{\Delta\,x}{x}\right)^3 - \text{\&c.}$$

$$D\,l\,.\,x = \frac{1}{x},$$

$$d\,(l\,.\,x) = \frac{d\,x}{x}.$$

Generally, if y be any function $(\phi\,x)$ of x, and $y + \Delta\,y$ be what y becomes, when $x + \Delta\,x$ is put for x; then $\Delta y = \phi\,(x + \Delta\,x) - \phi\,x = D\,\phi\,x\,.\,\Delta\,x + \frac{D^2}{c}\,\phi\,x\,.\,(\Delta\,x)^2$ + &c. or $= \frac{d\,y}{d\,x}\,\Delta\,x + \frac{\frac{d^2}{c}\,y}{d\,x^2}\,(\Delta\,x)^2 +$ &c.; in which formula $\frac{d\,y}{d\,x}$, $\frac{\frac{d^2}{c}\,y}{d\,x^2}$, &c. are to be considered as types of calculation, $\frac{d\,y}{d\,x}$ denoting that in y a function of x, $x + d\,x$ is

to be put for x, and the co-efficient of the ſecond term of the expanded expreſſion is to be taken.

To find the entire difference, and the differential of y, a function of p, q, r, s, &c. when p, q, r, s, &c. are ſimple functions of x.

Then when x becomes $x + \Delta x$, p becomes $p + \Delta p$, q becomes $q + \Delta q$, &c. and y becomes $y + \Delta y$; and

$$y + \Delta y = y^2 + D y . \Delta x + \underset{c}{D^2} y (\Delta x)^2 + \underset{c}{D^3} y (\Delta x)^3$$

$$p + \Delta p = p^2 + D p . \Delta x + \underset{c}{D^2} p (\Delta x)^2 + \underset{c}{D^3} p (\Delta x)^3$$

$$q + \Delta q = q^2 + D q . \Delta x + \underset{c}{D^2} q (\Delta x)^2 + \underset{c}{D^3} q (\Delta x)^3$$

$$r + \Delta r = r^2 + D r . \Delta x + \underset{c}{D^2} r (\Delta x)^2 + \underset{c}{D^3} r (\Delta x)^3$$

Therefore in the expreſſion for the value of y ſubſtitute the new values of p, q, r, &c. and the co-efficient of Δx ſhall be equal $D y$, or the differential co-efficient of y.

Example 1ſt.—Let $y = ap + q + r$ &c.

Then ſince $y + D y . \Delta x + \underset{c}{D^2} y (\Delta x)^2$

$$= p + D p . \Delta x + \underset{c}{D^2} p (\Delta x)^2 \text{ &c.}$$
$$+ q + D q . \Delta x + \underset{c}{D^2} q (\Delta x)^2 \text{ &c.}$$
$$+ r + D r . \Delta x + \underset{c}{D^2} r (\Delta x)^2 \text{ &c.}$$
$$D y = D p + D q + D r \text{ &c.}$$

Therefore

$$d y = D y . d x = D p . d x + D q . d x + D . r . d x \text{ &c.}$$
$$= \frac{d y}{d x} . d x = \frac{d p}{d x} . d x + \frac{d y}{d x} d x + \frac{d r}{d x} \text{ &c.}$$

The entire difference Δy = evidently

$$\Delta (p + q + r + \text{&c.}) = (D p + D q + D r) \Delta x$$
$$+ (\underset{c}{D^2} p + \underset{c}{D^2} q + \underset{c}{D} r \text{ &c}) \Delta x^2 + \text{&c.}$$

Let y be a ſimple function of p, then p becomes $p + \Delta p$;

y becomes $y + \frac{d y}{d p} . \Delta p + \frac{d^2 y}{d p^2} . \frac{\Delta p^2}{1.2} + \frac{d^3 y}{d p^3} . \frac{\Delta p^3}{1.2.3}.$

If p be at the ſame time ſuppoſed a function of x, then x becoming $x + \Delta x$, y becomes likewiſe $y + \Delta y = y + \frac{d y}{d x} . \Delta x + \frac{d^2 y}{d x^2} . \frac{\Delta x^2}{1 . 2} + \frac{d^3 y}{d x^3} . \frac{\Delta x^3}{1 . 2 . 3}.$

Now p being conſidered as a function of x, x becoming $x + \Delta x$, p becomes

$$p + \frac{d p}{d x} . \Delta x + \frac{d^2 p}{d x^2} . \frac{\Delta x^2}{1 . 2} + \frac{d^3 p}{d x^3} . \frac{\Delta x^3}{1 . 2 . 3} \text{ &c.}$$

$$\therefore \Delta p = \frac{d p}{d x} . \Delta x + \frac{d^2 p}{d x^2} . \frac{\Delta x^2}{1 . 2} + \frac{d^3 p}{d x^3} . \frac{\Delta x^3}{1 . 2 . 3} \text{ &c.}$$

Now ſubſtitute this value of Δp in the equation for the value of $y + \Delta y$,

$$y + \Delta y = y + \frac{d y}{d p} . \frac{d p}{d x} . \Delta x + \frac{d y}{d p} . \frac{d^2 p}{d x^2} . \frac{\Delta x^2}{1 . 2} + \frac{d y}{d p} . \frac{d^3 p}{d x^3} . \frac{\Delta x^3}{1 . 2 . 3} + \text{&c.} + \frac{d^2 y}{d p^2} . \tfrac{1}{2} \left(\frac{d p}{d x} . \Delta x + \frac{d^2 p}{d x^2} . \frac{\Delta x^2}{1 . 2} + \text{&c.}\right)^2 + \text{&c.}$$

Then by comparing the co-efficients of Δx in the two values of y,

$$\frac{d y}{d x} = \frac{d y}{d p} . \frac{d p}{d x} \quad \therefore \frac{d y}{d p} = \frac{\frac{d y}{d x}}{\frac{d p}{d x}}$$

$$\frac{d^2 y}{d x^2} = \frac{d y}{d p} . \frac{d^2 p}{d x^2} + \frac{d^2 y}{d p^2} \left(\frac{d p}{d x}\right)^2$$

$$\text{And } \frac{d^2 y}{d p^2} = \frac{\frac{d y^2}{d x^2} - \frac{d y}{d p} . \frac{d^2 p}{d x^2}}{\left(\frac{d p}{d x}\right)^2}$$

$$= \frac{\frac{d^2 y}{d x^2} - \frac{\frac{d y}{d x}}{\frac{d p}{d x}} . \frac{d^2 p}{d x^2}}{\left(\frac{d p}{d x}\right)^2}$$

$$= \frac{\frac{d^2 y}{d x^2}}{\left(\frac{d p}{d x}\right)^3} - \frac{\frac{d y}{d x} . \frac{d^2 p}{d x^2}}{\left(\frac{d p}{d x}\right)^3}$$

Example 2d.—Let $y = (a x - x^2)^{\frac{1}{2}}$ required the values of $\frac{d y}{d x}$, $\frac{d^2 y}{d x^2}$, $\frac{d^3 y}{d x^3}$, &c. Put $a x - x^2 = p$:

$$\frac{d p}{d x} = a - 2 x$$

$$\frac{d y}{d p} = \tfrac{1}{2} p^{-\frac{1}{2}} = \frac{1}{2 \sqrt{a x - x^2}}$$

$$\therefore \frac{d y}{d x} = \frac{d y}{d p} . \frac{d p}{d x} = \frac{a - 2 x}{2 \sqrt{a x - x^2}}.$$

$$\text{Again } \frac{d^2 p}{d x^2} = 2 \therefore \frac{d y}{d p} . \frac{d^2 p}{d x^2} = \frac{1}{\sqrt{a x - x^2}} = \text{1ſt term}$$

$$\left(\frac{d p}{d x}\right)^2 = \overline{a - 2 x}|^2$$

$$\frac{d^2 y}{d p^2} = - \tfrac{1}{4} p^{-\frac{3}{2}} = - \frac{1}{4 \sqrt{(a x - x^2)}^{\frac{3}{2}}}$$

$$\therefore \left(\frac{d p}{d x}\right)^2 . \frac{d^2 y}{d p^2} = - \frac{(a - 2 x)^2}{4 \sqrt{(a x - x^2)}^{\frac{3}{2}}}$$

$$\therefore \frac{d^2 y}{d x^2} = \frac{d^2 p}{d x^2} . \frac{d y}{d p} + \left(\frac{d p}{d x}\right)^2 . \frac{d^2 y}{d p^2} = \frac{1}{\sqrt{a x - x^2}} - \frac{(a - 2 x)^2}{4 \sqrt{(a x - x^2)}^{\frac{3}{2}}}$$

Example 3d: $y = (x^2 - a^2)^{\frac{1}{2}}$ $p = (x^2 - a^2)$

$$\frac{d p}{d x} = 2 x$$

$$\frac{d y}{d p} = \tfrac{1}{2} p^{-\frac{1}{2}} = \frac{1}{2 \sqrt{x^2 - a^2}}$$

$$\frac{d y}{d x} = \frac{x}{\sqrt{x^2 - a^2}}$$

$$\frac{d^2 p}{d x} = 2; \quad \frac{d y}{d p} . \frac{d^2 p}{d x} = \frac{1}{\sqrt{x - a^2}} = \text{1ſt term}$$

$$\left(\frac{d p}{d x}\right)^2 = 4 x^2$$

$$\frac{d^2 y}{d p^2} = - \tfrac{1}{4} p^{-\frac{3}{2}} = - \frac{1}{4 (x^2 - a^2)^{\frac{3}{2}}}$$

$\left(\frac{d p}{d x}\right)^2$

$\left(\frac{dp}{dx}\right)^2 \cdot \frac{d^2y}{dp^2} = \frac{-x^2}{(x^2-a^2)^{\frac{3}{2}}} = $ 2d term

$\frac{d^2y}{dx^2} = \frac{1}{\sqrt{x^2-a^2}} - \frac{x^2}{(x^2-a^2)^{\frac{3}{2}}}$

Example 4th.—Let $y = b + (r^2 - (a-x)^2)^{\frac{1}{2}}$

Suppose $(a-x)^2 = p$; then $y = (r^2 - p)^{\frac{1}{2}}$ required the value of $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$

$\frac{dp}{dx} = 2x - 2a$

$\frac{dy}{dp} = \frac{1}{2}(r^2-p)^{-\frac{1}{2}} \therefore \frac{dp}{dx} \cdot \frac{dy}{dp} = \frac{dy}{dx} = \frac{x-a}{(r^2-(a-x)^2)^{\frac{1}{2}}}$

$\frac{d^2p}{dx^2} = 2 \therefore \frac{dy}{dp} \cdot \frac{d^2p}{dx^2} = \frac{1}{\sqrt{r^2-(a-x)^2}}$

$\left(\frac{dp}{dx}\right)^2 = 4(a-x)^2$

$\frac{d^2y}{dp^2} = -\frac{1}{4}(r^2-p)^{-\frac{3}{2}} = \frac{1}{4(r^2-(a-x)^2)^{\frac{3}{2}}}$

$\left(\frac{dp}{dx}\right)^2 \cdot \frac{d^2y}{dp^2} = -\frac{(a-x)^2}{(r^2-(a-x)^2)^{\frac{3}{2}}}$

$\therefore \frac{d^2y}{dx^2} = \frac{1}{\sqrt{r^2-(a-x)^2}} + \frac{-(a-x)^2}{(r^2-(a-x)^2)^{\frac{3}{2}}}$

$= \frac{r^2-(a-x)^2}{(r^2(a-x)^2)^{\frac{3}{2}}} + \frac{(a-x)^2}{(r^2-(a-x)^2)^{\frac{3}{2}}} = \frac{r^2}{(r^2-(a-x)^2)^{\frac{3}{2}}}$

Example 5th. Let $y = (x-a)^2 \cdot \sqrt{x-b}$

$p = (x-a)^2$
$q = (x-b)^{\frac{1}{2}}$

$\frac{dy}{dx} = p \cdot \frac{dq}{dx} + q \cdot \frac{dp}{dx}$

$= (x-a)^2 \cdot \frac{1}{2}(x-b)^{-\frac{1}{2}} + (x-b)^{\frac{1}{2}} \cdot 2(x-a)$

$= \frac{(x-a)^2}{2\sqrt{x-b}} + 2(x-a) \cdot \sqrt{x-b}$

$\frac{d^2y}{dx^2} = p \cdot \frac{d^2q}{dx^2} + q \cdot \frac{d^2p}{dx^2} + 2\left(\frac{dp}{dx} \cdot \frac{dq}{dx}\right)$

$= (x-a)^2 \cdot \frac{1}{4}(x-b)^{-\frac{3}{2}} + (x-b)^{\frac{1}{2}} \cdot 2(x-a)^{1-1}$
$+ 2(x-a) \cdot \frac{1}{2}(x-b)^{-\frac{1}{2}}$

$= 2\sqrt{x-b} + \frac{2(x-a)}{\sqrt{x-b}} - \frac{(x-a)^2}{4(x-b)^{\frac{3}{2}}}$

Let it now be required to find the differential of $\phi\,(p, q)$, p and q being functions of x.

Let p become $p + \Delta p$, and q, $q + \Delta q$, then $\phi\,(p, q)$ becomes $q\,(p + \Delta p,\ q + \Delta q)$, in which latter form $p + \Delta p$, $q + \Delta q$, are to be combined in the same manner as p, q are in $\phi\,(p, q)$, hence expanding $\phi\,(p + \Delta p,\ q + \Delta q)$, according to the powers of Δp,

$$\phi(p+\Delta p, q+\Delta q) = \phi(p, q+\Delta q) + \frac{d(\phi p, q+\Delta q)}{dp} \cdot \Delta p$$
$$+ \frac{d^2\phi(p, q+\Delta q)}{1 \cdot 2 \cdot dp^2} \cdot (\Delta p)^2 + \text{\&c.}$$

$=$ (expanding $\phi\,(p, q + \Delta q)$, &c.)

$$\phi\,(p, q) + \frac{d\phi(p,q)}{dq} \cdot \Delta p + \frac{d^2\phi(p,q)}{1 \cdot 2 \cdot dq^2}(\Delta q)^2 + \text{\&c.}$$
$$+ \frac{d\phi(p,q)}{dp} \cdot \Delta p + \frac{d^2\phi(p,q)}{dp \cdot dq} \cdot \Delta p \cdot \Delta q + \text{\&c.}$$

in which form the symbols $\frac{d\phi(p,q)}{dq}$, $\frac{d\phi(p,q)}{dp}$, respectively denote the differential co-efficients of $\phi\,(p, q)$, on the hypothesis, that q is alone variable in $\phi\,(p, q)$, and that p is alone variable in $\phi\,(p, q)$; hence putting dq, dp, for Δq, Δp, the differential of $\phi\,(p, q)$, or the term affected with dx (since $dp = \frac{dp}{dx} \cdot dx$, $dq = \frac{dq}{dx} \cdot dx$) $= \frac{d\phi(p,q)}{dq} \cdot dq + \frac{d\phi(p,q)}{dp} \cdot dp$.

If P be put for $\phi\,(p, q)$, then the symbols $\frac{d\phi(p,q)}{dq}$, $\frac{d\phi(p,q)}{dp}$ are expressed by $\frac{dP}{dq}$, $\frac{dP}{dp}$, consequently the differential of P or $dP = \frac{dP}{dq} \cdot dq + \frac{dP}{dp} \cdot dp$.

In like manner, if P denote a function of p, q, r, s, &c. or $= \phi\,(p, q, r, s,$ &c.) then its differential $= \frac{dP}{dp} \cdot dp + \frac{dP}{dq} \cdot dq + \frac{dP}{dr} \cdot dr + \frac{dP}{ds} \cdot ds +$ &c.

The expressions $\frac{dP}{dp} \cdot dp$, $\frac{dP}{dq} \cdot dq$, &c. are called partial differentials of the function P, and $\frac{dP}{dp}$, $\frac{dP}{dq}$, &c. partial differential co-efficients.

Ex. Let $\phi\,(p, q)$ or P be represented by $(1 + p^2)^m \cdot e^q$,

then $\frac{dP}{dq} = 2mp \cdot (1+p^2)^{m-1}\, e^q$ $\frac{dP}{dq} = (1+p^2)^m \cdot e^q$,

$\therefore dP = 2mp\,dq \cdot (1+p^2)^{m-1} \cdot e^q + e^q\,dq \cdot (1+p^2)^m$;

again, let $P = p^2\,(2pq + q^2)^{\frac{1}{2}}$,

then $\frac{dP}{dq} = (2pq + q^2)^{\frac{1}{2}} + \frac{qp}{(2pq+q^2)^{\frac{1}{2}}} = \frac{3pq+q^2}{(2pq+q^2)^{\frac{1}{2}}}$

$\frac{dP}{dq} = \frac{p^2+pq}{(2pq+q^2)^{\frac{1}{2}}}$

$\therefore dP = \frac{3pq+q^2}{(2pq+q^2)^{\frac{1}{2}}} \cdot dp + \frac{p^2+pq}{(2pq+q^2)^{\frac{1}{2}}} \cdot dq.$

Suppose now y to be determined by an equation between x and y, as in $y^2 - 2xy + x^2 - a^2 = 0$, $x^3 - axy + y^3 = 0$; in which cases y is said to be an implicit function of x, the explicit functions being those which are under the form $y = ax + bx^2 + cx^3 +$ &c. $y = \frac{1 + \alpha x}{1 + \beta x^2 + \gamma x}$ &c.; and let the equation on which the value of the implicit function of y depends, be generally represented by $\phi\,(x, y) = 0$; then if y can thence be determined to be a function of x, when x becomes $x + \Delta x$, y becomes $y + \underset{c}{D} \cdot y \cdot \Delta x + \underset{c}{D^2} \cdot y \cdot (\Delta x)^2 +$ &c.

$\therefore$ Substituting in the equation $\phi\,(x, y) = 0$, for x and y the above values, we have $\phi\,(x + \Delta x,\ y + \underset{c}{D} \cdot y \cdot \Delta x + \underset{c}{D^2} y \cdot (\Delta x)^2 +$ &c.$) = 0$; or putting $\phi\,(x, y) = X$, and expanding $X + \frac{d(X)}{dx} \cdot \Delta x + \frac{d^2(X)}{dx^2} \cdot (\Delta x)^2$ &c. $= 0$, and as this equation subsists, whatever Δx is, each separate co-efficient affected with a different power of Δx must be put $= 0$;

 hence

hence $\frac{d(X)}{dx} = 0$, or $\frac{dX}{dy} \cdot \frac{dy}{dx} + \frac{dX}{dx} = 0$;

again $\frac{d^2X}{dx^2} = 0$, or

$$\frac{dX}{dy} \cdot \frac{d^2y}{dx^2} + \frac{dX}{dy \cdot dx} \cdot \frac{dy}{dx} + \frac{d^2X}{dy^2}\left(\frac{dy}{dx}\right) + \frac{d^2X}{dx^2} = 0;$$

again $\frac{d^3X}{dx^3} = 0$, or &c. &c.

in which forms $\frac{dX}{dy}$ means the partial differential co-efficient of X, or $\phi(x, y)$ relatively to y, $\frac{d^2X}{dx \cdot dy}$ the partial differential co-efficient of X, when the differential is taken twice, first relatively to x, and next relatively to y.

Hence it follows, that when there is an equation between two variable quantities x, y, the equation likewise subsists between their first differential equations, between their second differential equations, &c. and so on.

Ex. $y^2 + 2xy + m^2x^2 - a^2 = 0$

$\therefore 2y\,dy + 2x\,dy + 2y\,dx + 2m^2x\,dx = 0$

$\therefore \frac{dy}{dx} = -\frac{y + m^2x}{y + x}$.

Again, let $y^3 + 3axy + x^3 = 0$

$\therefore 3y^2\,dy - 3ax\,dy - 3ay\,dx + 3x^2\,dx = 0$

$\therefore \frac{dy}{dx} = \frac{3ay - 3x^2}{3y^2 - 3ax} = \frac{ay - x^2}{y^2 - ax}$.

When $y = \frac{fx}{Fx}$, or when y represents such a function of x as $\frac{fx}{Fx}$, $yFx = fx$.

But it has been shewn that $d(yFx) = d(fx)$; or expanding $Fx \cdot \frac{dy}{dx} \cdot dx + y\frac{dFx}{dx} \cdot dx = \frac{dfx}{dx} \cdot dx$; or since $Dy = \frac{dy}{dx}$, $DFx = \frac{dFx}{dx}$, &c.

$Fx \cdot D \cdot y + y \cdot DFx = Dfx$.

Suppose now $\frac{fx}{Fx}$ to be one of those fractions whose numerators and denominators vanish on giving x a particular value (a); put $x = a$, then $Fx = 0$, and the preceding equation becomes

$$y \cdot \frac{dFx}{dx} = \frac{dfx}{dx} \qquad \text{and } y = \frac{\frac{dfx}{dx}}{\frac{dFx}{dx}}$$

$$\text{or} = \frac{Dfx}{DFx},$$

which is the same result as was found above, as indeed it must necessarily be, since each method is derived from the same source, and conducted by a like reasoning.

If it so happens that Dfx, DFx, become nothing when $x = a$, then the second differential of the equation $yFx = fx$ must be taken, thus since it has been proved that $Fx \cdot D \cdot y + y \cdot DFx = Dfx$,

$$d(Fx \cdot D \cdot y) + d(y \cdot DFx) = d(Dfx),$$

or $dFx \cdot D \cdot y + Fx \cdot d(D \cdot y) + dy \cdot DFx + y\,d(DFx) = d(Dfx)$,

or $DFx \cdot D \cdot y + Fx \cdot D^2 \cdot y + D \cdot y \cdot DFx + y \cdot D^2Fx = D^2fx$, (putting for dFx, dy, their values $DFx \cdot dx$, $D \cdot y \cdot dx$, and dividing every term by dx),

or $2DFx \cdot D \cdot y + Fx \cdot D^2 \cdot y + y \cdot D^2Fx = D^2fx$; putting $x = a$, since by hypotheses fx, Fx, Dfx, $DFx = 0$, the above equation is reduced to $y \cdot D^2Fx = D^2fx$, and consequently $y = \frac{D^2fx}{D^2Fx}$, the same result as already given, and the two results must necessarily agree, being derived from the same principle, and by the same process.

If D^2fx, D^2Fx, putting $x = a$, likewise become 0, then the third differential of the equation $yFx = fx$ must be taken, and then we shall obtain $y \frac{D^3fx}{D^3Fx}$, and so on.

The following investigation of the differential of the sines and cosines of angles is given by Lagrange, but the notation used by Mr. Woodhouse is substituted instead of that given in the "Fonctions Analytiques."

$$\text{sin.}\,(x + y) = \text{sin.}\,x \cdot \text{cos.}\,y + \text{cos.}\,x \cdot \text{sin.}\,y$$
$$\text{cos.}\,(x + y) = \text{cos.}\,x \cdot \text{cos.}\,y - \text{sin.}\,x \cdot \text{sin.}\,y$$

For x substitute $x + \Delta x$, and expand the functions sin. $(x + \Delta x)$ and cos. $(x + \Delta x)$ according to the powers of Δx; the co-efficients of Δx in these expansions will be the derived functions or differential co-efficients required. By the preceding formulæ

$$\text{sin.}\,(x + \Delta x) = \text{sin.}\,x \cdot \text{cos.}\,\Delta x + \text{cos.}\,x \cdot \text{sin.}\,\Delta x$$
$$\text{cos.}\,(x + \Delta x) = \text{cos.}\,x \cdot \text{cos.}\,\Delta x - \text{sin.}\,x \cdot \text{sin.}\,\Delta x$$

It remains now to expand into series the quantities sin. Δx, cos. Δx.

Assuming with Lagrange that the series for the sin. Δx must be of this form $A(\Delta x)^m + B(\Delta x)^n +$ &c. m and n being whole numbers and increasing, then making x and $y = \Delta x$

sin. $2 \cdot \Delta x = 2$ sin. $\Delta x \cdot$ cos. $\Delta x = 2$ sin. $\Delta x \sqrt{1 - \text{sin.}^2\Delta x}$; and since the sine of $\Delta x = A(\Delta x)^m + B\,\Delta x^n +$ &c.

sin. $2\Delta x = 2^m \cdot A(\Delta x)^m + 2^n \cdot B(\Delta x)^n +$ &c.

Also, $\text{sin.}^2\Delta x = A^2(\Delta x)^{2m} + 2A \cdot B \cdot (\Delta x)^{m+n}$ &c.

and $\sqrt{1 - \text{sin.}^2\Delta x} = (1 - \text{sin.}^2\Delta x)^{\frac{1}{2}} = 1 - \frac{1}{2}A^2\Delta x^{2m} - A \cdot B \cdot (\Delta x)^{m+n} -$ &c. therefore $2\,\text{sin.}\,\Delta x \sqrt{1 - \text{sin.}^2\Delta x} = 2A\,(\Delta x)^m + 2B\,(\Delta x)^n +$ &c. $- A^3(\Delta x)^{3m} -$ &c. which series being identical with the following:

$$2^m A(\Delta x)^m + 2^n B(\Delta x)^n + \text{&c.}$$

which expresses the value of sin. $2\Delta x$; the comparison of the first terms which contain the same power $(\Delta x)^m$ will give

$$2A = 2^m A;\ \text{hence } m = 1.$$

Hence it appears that the first term of the series of sin. Δx is $A \cdot \Delta x$, consequently, the two first terms of the series for cos. Δx will be $1 - \frac{A^2\Delta x^2}{2}$, making these substitutions in the expressions sin. $(x + \Delta x)$ and cos. $(x + \Delta x)$, and considering only the first power of Δx,

$$\text{sin.}\,(x + \Delta x) = \text{sin.}\,x + A \cdot \Delta x \cdot \text{cos.}\,x + \text{&c.}$$
$$\text{cos.}\,(x + \Delta x) = \text{cos.}\,x - A \cdot \Delta x\ \text{sin.}\,x + \text{&c.}$$

Hence the derived function, or differential co-efficient of sin. x will be $A \cdot$ cos. x, and that of cos. x will be $- A \cdot$ sin. x.

The co-efficient A is an unknown constant quantity, to be determined by the nature of the circle.

Having thus found the first differential co-efficients, the others may be found in the same manner; thus, D . sin. x being A cos. x, D^2. sin. x will be $- A^2$ sin. x, and D^3. sin. x will be $- A^2$ cos. x.

Therefore,

Therefore, in general, if y or $\phi\, x = \text{ſin.}\, x$

$$\frac{dy}{dx} = A\,.\,\text{coſ.}\, x\,;\ \frac{d^2 y}{d x^2} = A^2.\,\text{ſin.}\, x\,;\ \frac{d^3 y}{d x^3} = -\,A^3\,\text{coſ.}\, x$$

&c.

Making theſe ſubſtitutions in the expanded ſeries for $\phi\,(x + \Delta x)$

$$\text{ſin.}\,(x + \Delta x) = \text{ſin.}\, x + A\,.\,\Delta x\,.\,\text{coſ.}\, x - \frac{A^2\,\Delta x^2}{2}\,\text{ſin.}\, x - \frac{A^3\,\Delta x^3}{2\cdot 3}\,\text{coſ.}\, x + \frac{A^4\,\Delta x^4}{2\cdot 3\cdot 4}\,\text{ſin.}\, x + \ \&c.$$

In the ſame manner, if y or $\phi\, x = \text{coſ.}\, x$

$$\frac{dy}{dx} = -\,A\ \text{ſin.}\, x\,;\ \frac{d^2 y}{d x^2} = -\,A^2\,\text{coſ.}\, x\,;\ \frac{d^3 y}{d x^3} = A^3\,\text{ſin.}\, x\,;$$

$$\frac{d^4 y}{d x^4} = A^4\,\text{coſ.}\, x,\ \&c.$$

And theſe ſubſtitutions will give

$$\text{coſ.}\, x + \Delta x = \text{coſ.}\, x - A\,.\,(\Delta x)\ \text{ſin.}\, x - \frac{A^2\,(\Delta x)^2}{2}\,\text{coſ.}\, x + \frac{A^3\,(\Delta x)^3}{2\cdot 3}\,\text{ſin.}\, x + \frac{A^4\,(\Delta x)^4}{2\cdot 3\cdot 4}\,\text{coſ.}\, x - \&c.$$

Let $P = A\,.\,\Delta x - \dfrac{A^3\,(\Delta x)^3}{2\cdot 3} + \dfrac{A^5\,(\Delta x)^5}{2\cdot 3\cdot 4\cdot 5}\ \&c.$

$$Q = 1 - \frac{A^2\,(\Delta x)^2}{2} + \frac{A^4\,(\Delta x)^4}{2\cdot 3\cdot 4} - \frac{A^6\,(\Delta x)^6}{2\cdot 3\cdot 4\cdot 5\cdot 6} + \&c.$$

Then $\text{ſin.}\ (x + \Delta x) = Q\ \text{ſin.}\, x + P\ \text{coſ.}\, x$

$\text{coſ.}\ (x + \Delta x) = Q\ \text{coſ.}\, x - P\ \text{ſin.}\ x$

Hence $\text{ſin.}\ \Delta x = P$, and $\text{coſ.}\ \Delta x = Q$.

Thus, whatever be the angle Δx

$$\text{ſin.}\ \Delta x = A\,.\,\Delta x - A^3\frac{(\Delta x)^3}{2\cdot 3} + A^5\frac{(\Delta x)^5}{2\cdot 3\cdot 4\cdot 5} - \ \&c.$$

$$\text{coſ.}\ \Delta x = 1 - A^2\frac{(\Delta x)^2}{2} + A^4\,\frac{(\Delta x)^4}{2\cdot 3\cdot 4} - \ \&c.$$

It is evident that theſe ſeries are both of them convergent, provided the angle Δx is ſuch that $A\,.\,\Delta x$ be leſs or equal to unity; in that caſe

$$\text{ſin.}\,\Delta x \angle\ A\,.\,\Delta x \text{ and } \urcorner\ A\,.\,\Delta x - \frac{A^3\,.\,\Delta x^3}{2\cdot 3}$$

for the terms having alternate ſigns and continually diminiſhing, the ſum of the ſecond and third of the fourth and fifth, &c. will be all negative, and on the contrary, the ſums of the third and fourth, the fifth and ſixth, &c. will be all poſitive.

Now by the theorem of Archimedes, we may aſſume, that the ſine is always leſs than the arc, and the tangent always greater. Hence

$$\text{ſin.}\ \Delta x < \Delta x, \text{ and } \frac{\text{ſin.}\ \Delta x}{\text{coſ.}\ \Delta x} > \Delta x$$

but $\text{coſ.}\ \Delta x = \sqrt{1 - \text{ſin.}^2\,\Delta x}$

therefore $\dfrac{\text{ſin.}\ \Delta x}{\sqrt{1 - \text{ſin.}^2\,\Delta x}} > \Delta x\,;\ \text{ſin.}^2\ \Delta x > (\Delta x)^2\ (1 - \text{ſin.}^2\ \Delta x)$

$$\text{hence}\quad \text{ſin.}\ \Delta x > \frac{\Delta x}{\sqrt{1 + (\Delta x)^2}}$$

And from the property of the circle

$$\text{ſin.}\ \Delta x < \Delta x, \text{ and} > \frac{1}{\sqrt{1 + (\Delta x)^2}}$$

If the angle Δx be taken leſs than 90°, and ſo ſmall that $A\,.\,\Delta x$ be leſs than unity, then

$$\text{ſin.}\,\Delta x < A\,.\,\Delta x, \text{ and} > \frac{1}{\sqrt{1 + (\Delta x)^2}}$$

and conſequently $A\,.\,\Delta x > \dfrac{1}{\sqrt{1 + \Delta x^2}}$ and $A > \dfrac{1}{\sqrt{1 + (\Delta x)^2}}$; likewiſe $\text{ſin.}\ \Delta x > A\,.\,\Delta x - \dfrac{A^3\ \Delta x^3}{2\cdot 3}$ and $< \Delta x$, and conſequently $A\,\Delta x - \dfrac{A^3.\,(\Delta x)^3}{2\cdot 3} < \Delta x$ and $A - \dfrac{A^3\,(\Delta x)^3}{2\cdot 3} < \Delta x$, or $A < 1 + \dfrac{A^3\,(\Delta x)^3}{2\cdot 3}$.

As theſe conditions muſt take place however ſmall Δx, it reſults that A cannot be leſs than unity, for if $A < 1$ we ſhould have $\dfrac{1}{A} > 1$; but the condition $A > \dfrac{1}{\sqrt{1 + (\Delta x)^2}}$ gives $\dfrac{1}{A} < \sqrt{1 + (\Delta x)^2}$; therefore if $\dfrac{1}{A}$ ſurpaſſes unity by ever ſo ſmall a quantity, it will be always poſſible to take Δx ſuch, that $\sqrt{1 + (\Delta x)^2} < \dfrac{1}{A}$, whereas this quantity muſt always be $> \dfrac{1}{A}$.

It appears from the ſecond condition that A cannot be greater than unity, for if A ſurpaſſes unity by ever ſo ſmall a quantity, it will always be poſſible to take Δx ſo ſmall, that $1 + \dfrac{A^3\,(\Delta x)^3}{2\cdot 3} < A$, whereas we ſhould always have $1 + \dfrac{A^3\,(\Delta x)^3}{2\cdot 3} > A$.

Therefore ſince A can neither be leſs or greater than unity, it follows that $A = 1$.

Therefore the derived function of the differential co-efficient of $\text{ſin.}\, x$ is ſimply $= \text{coſ.}\, x$;

and that of $\text{coſ.}\, x = -\ \text{ſin.}\, x$; x denoting any angle whatever, that is, an arc of a circle whoſe rad. $= 1$. Therefore for any angle Δx

$$\text{ſin.}\ \Delta x = \Delta x - \frac{(\Delta x)^3}{2\cdot 3} + \frac{(\Delta x)^5}{2\cdot 3\cdot 4\cdot 5} + \frac{(\Delta x)^7}{2\cdot 3\cdot 4\cdot 5\cdot 6\cdot 7} + \&c.$$

$$\text{coſ.}\ \Delta x = 1 - \frac{(\Delta x)^2}{2} + \frac{(\Delta x)^4}{2\cdot 3\cdot 4} + \frac{(\Delta x)^6}{2\cdot 3\cdot 4\cdot 5\cdot 6} + \&c.$$

which well known formulæ were diſcovered by Newton. In the ſame manner as the ſine and co-ſine are functions of the angle; the angle itſelf may be conſidered as a function of the ſine or co-ſine and its differential found.

Let $\phi\, x\, z =$ angle of ſine x; then $\text{ſin.}\ \phi\, x = x$; let x become $x + \Delta x$, and ſuppoſe

$$\frac{dz}{dx}\,.\,\Delta x + \frac{d^2 z}{2\,.\,d x^2}\,.\,(\Delta x)^2 + \frac{d^3 x}{2\,.\,3\,.\,d x^3}\ (\Delta x)^3 + \&c.$$

$= n$; then $\text{ſin.}\ (\phi\, x + n) = x + \Delta x = \text{ſin.}\ (\phi\, x)\ \text{coſ.}\, n + \text{coſ.}\ (\phi\, x)\ .\ \text{ſin.}\, n$; and $\text{ſin.}\ (\phi\, x) = x$; $\text{coſ.}\ (\phi\, x) = \sqrt{1 - \text{ſin.}^2\,\phi\, x} = \sqrt{1 - x^2}$.

Moreover by the above formulæ

$$\text{ſin.}\ n = n - \frac{n^3}{2\,.\,3} + \&c. \text{ and } \text{coſ.}\ n = n - \frac{n}{2} + \&c.$$

Making

Making therefore these substitutions, and restoring the value of n, we shall have

$$x + \Delta x = x + \Delta x \sqrt{(1 - x^2)} \cdot \frac{dz}{dx} + \frac{(\Delta x)^2}{2}$$

$$\left(\sqrt{(1 - x)} \cdot \frac{d^2 z}{dx^2}\right)$$ + &c. which, by comparing the first terms affected with Δx, gives

$$1 = \sqrt{(1 - x^2)} \cdot \frac{dz}{dx},$$ from which results

$$\frac{dz}{dx} = \frac{1}{\sqrt{1 - x^2}}.$$

The comparison of the other terms will give the second and third, &c. differentials.

In like manner, if

ϕx = angle cos. x; x = cos. (ϕx)

for x put $x + \Delta x$, and $\phi x + n$ for ϕx; then

$x + \Delta x$ = cos. $(\phi x + n)$ = cos. (ϕx) . cos. n — sin. (ϕx) sin. n; and cos. $(\phi x) = x$, and sin. $(\phi x) = \sqrt{(1 - \text{cos.}^2 (\phi x))} = \sqrt{1 - x^2}$.

Making these substitutions, and putting for sin. n . cos. n, their values in series, $n - \frac{n^3}{2 \cdot 3}$ &c.

and $1 - \frac{n^2}{2}$ + &c. as in the former example; then

$$x + \Delta x = x - \Delta x \sqrt{(1 - x^2)} \frac{dz}{dx} - \frac{(\Delta x)^2}{2}$$

$$\left(\sqrt{(1 - x^2)} \frac{d^2 z}{dx^2}\right)$$ + &c. which gives $1 = -\sqrt{(1 - x^2)}$ $\frac{dz}{dx}$ and $\frac{dz}{dx} = -\frac{1}{\sqrt{1 - x^2}}$.

Since therefore x being the sine of an angle, $\sqrt{1 - x^2}$ is the cosine, and x being the cosine, $\sqrt{1 - x^2}$ is the sine; it follows from the above investigation, that the differential of an angle expressed by its sine is equal to unity divided by its cosine, and the differential of an angle expressed by its cosine is equal to unity divided by its sine, taken with a negative sign.

On the use of differential Equations in the transformation of Functions.—When the function of a variable quantity is presented under two different forms, by equalling these expressions we obtain what is called an identical equation, because of the identity of the value, and which must subsist independently of the variable quantity, that is, we may assign to the variable quantity x any value Δx whatever.

Let $\phi x = 0$ be a similar equation, then

$\phi (x + \Delta x) = 0$, and

$\phi x + D \phi x . \Delta x + \frac{D^2}{c} \phi x . (\Delta x)^2$ + &c. $= 0$;

and therefore separately

$\phi x = 0$; $D \phi x = 0$; $\frac{D^2}{c} \phi x = 0$, &c.

The same equation therefore subsists between the differentials of any order whatever.

Suppose now an equation, as $\phi (x,y) = 0$ between two variable quantities x and y, in which y must be some function of x, then from what has been said it follows that the same equation subsists between all the differential equations of any order whatever.

And in general, first and second differential equations, &c. are so termed, not only when they are directly deduced from the primitive equation, but when they consist of any combination of the differential and primitive equation; thus, when the primitive equation contains x and y, the first differential equation will contain x, y, and $\frac{dy}{dx}$, the second, y, x, $\frac{dy}{dx}$, $\frac{d^2 y}{dx^2}$ and so on; and by what has preceded, one of those systems of equations may always be transformed into another.

To illustrate the use of these equations in the transformation of functions by an example, let us take the case of sin. x, and cos. x, the differentials of which have been already investigated.

Let y = sin. x; z = cos. x; then

$\frac{dy}{dx}$ = cos. x, and $\frac{dz}{dx}$ = — sin. x, consequently

$$\frac{dy}{dx} = z, \text{ and } \frac{dz}{dx} = -y.$$

If we multiply the first of these equations by $\sqrt{-1}$, and then add it to the second, $\frac{dz}{dx} + \frac{dy}{dx}\sqrt{-1} = z\sqrt{-1} - y = (z + y\sqrt{-1})\sqrt{-1}$;

hence the equation

$$\frac{\frac{dz}{dy} + \frac{dy}{dx}\sqrt{-1}}{z + y\sqrt{-1}} = \sqrt{-1}$$

Now from what has preceded, it appears that if p be any function of x, $\frac{\frac{dp}{dx}}{p}$ is the differential of the log. p; therefore

log. $(z + y\sqrt{-1}) = x\sqrt{-1} + k$ will be the primitive equation from which the preceding one may be considered as derived; k is an arbitrary constant-quantity to be determined by the nature of the functions y and z, conformably to the method of what we call finding fluents.

For this purpose we may observe that on making $x = 0$, we have sin. $x = 0$, and cos. $x = 1$; therefore $y = 0$, $z = 1$.

It is therefore necessary that the equation above found satisfies these suppositions; but in this case it becomes log. $1 = k$, and since log. $1 = 0$; $k = 0$; the equation therefore will simply be log. $(z + y\sqrt{-1}) = x\sqrt{-1}$;

hence $z + y\sqrt{-1} = e^{x\sqrt{-1}}$; e being the number whose Naperian log. is unity.

For y and z substitute their values sin. x, cos. x, and we obtain this remarkable formula

$$\text{cos. } x + \text{sin. } x\sqrt{-1} = e^{x\sqrt{-1}}$$

which from the double signification of the radical $\sqrt{-1}$ gives equally

$$\text{cos. } x - \text{sin. } x\sqrt{-1} = e^{x\sqrt{-1}}$$

and these equations combined are sufficient to determine the values of sin. x and cos. z. For by adding them or subtracting them we have

$$\text{cos. } x = \frac{e^{x\sqrt{-1}} + e^{-x\sqrt{-1}}}{2}$$

$$\text{sin. } x = \frac{e^{x\sqrt{-1}} - e^{-x\sqrt{-1}}}{2}$$

in

in which the sine and cosine is expressed in terms of imaginary exponentials, which may be considered as one of the most curious analytical discoveries of the last century.

These formulæ may likewise be derived immediately from the series already given which express the functions sin. x, cos. x, e^x. It is in this manner that Euler has given them in vol. vii. of the Miscellanea Berolinensia.

The expression for the value of arcs in imaginary logarithms was discovered by John Bernouilli, who has given it in the Memoirs of the Academy of Sciences for 1702. He obtained it by integrating by means of logarithms the elements of the arc expressed in terms of the tangent in the same manner as Leibnitz had found the series which expresses the arc by the tangent, by integrating the same element in series.

The equation cos. x + sin. $x\sqrt{-1} = e^{x\sqrt{-1}}$, where the radical $\sqrt{-1}$ may equally have the sign + or −, forms the basis of the theory of the calculation of angles; for by multiplying this equation by the similar equation cos. y + sin. $y\sqrt{-1} = e^{y\sqrt{-1}}$ we have (cos. x + sin. $x\sqrt{-1}$) (cos. y + sin. $y\sqrt{-1}$) = $e^{(x+y)\sqrt{-1}}$, and substituting in the same equation $x + y$ in the place of x,

cos. $(x+y)$ + sin. $(x+y)\sqrt{-1} = e^{(x+y)\sqrt{-1}}$;

comparing and expanding the product,

cos. x . cos. y − sin. x . sin. y + (cos. x . sin. y + cos. y sin. x) $\sqrt{-1}$ = cos. $(x+y)$ + sin. $(x+y)\sqrt{-1}$;

and as this equation must subsist for the two signs of $\sqrt{-1}$ it follows that separately

cos. x . cos. y − sin. x . sin. y = cos. $(x+y)$
cos. x sin. y + sin. x cos. y = sin. $(x+y)$

which formulæ may be demonstrated geometrically, and form the basis of the theory of angles.

In addition to the following investigation of what is usually called the inverse method of fluxions, as given by Mr. Woodhouse, the reader is referred to the article FLUENT, the substance of which is likewise taken from the works of this learned analyst.

In contradistinction to the direct operations of multiplication and involution, division and evolution are called reverse operations; but when all the results of these operations are comprehended under a common formula ($\phi x + D\phi x . \Delta x$ + &c.), or expressed by a general method, it is commodious to consider the latter method by which algebraic functions are expanded, and any term assigned as a direct method; and the method by which, from any term of an expanded function, we ascend to the original function, a reverse method.

On the former method depends the *differential calculus*, by which from ϕx the second, third, &c. terms of $\phi(x + dx)$ expanded, are assigned; on the reverse depends the *integral calculus*, by which from X . dx, X′ . dx^2, &c. the functions fx, $f'x$, of which functions X . dx, X′ . dx^2 &c. are the first, second differentials, &c. or are the second, third, &c. terms of $f(x + dx)$, $f'(x + dx)$ &c. expanded, are to be assigned. The integral calculus is unable, however, in all cases, to assign the original or primitive functions of fx, from which a differential X dx is derived; its rules (like those for the extraction of roots) are established by inspection of the direct process, by which, from primitive functions, differentials are obtained; thus d $(x^m) = m x^{m-1}$. dx, ∴ from $m x^{m-1}$. dx we may ascend to x^m by this process; increase the index $(m-1)$ of the power of the variable quantity (x) in the differential $(m x^{m-1}$. d$x)$ by 1; and then divide the differential by the index so increased (m), and by the differential (dx) of the variable quantity (x): the result of this process is the integral or primitive function (x^m). Let d^{-1} be the symbol of the operation by which the integral is obtained, (the reverse of that operation which d indicates), then d^{-1} $(m x^{m-1}$ d$x) = x^m$, or d^{-1} d $(x^m) = x^m$,

Again, d^{-1} $(x^{\frac{m}{n}}$ d$x) = \dfrac{x^{\frac{m}{n}+1}}{\frac{m}{n}+1}$; and d^{-1} $(x^{r-1} = \dfrac{x^r}{r . dx}$

Again, from what has preceded it appears, that if p be a function of x, the differential of $\phi p = D\phi p$. dp or $= \dfrac{d\phi p}{dp}$. dp; hence to find the integral or primitive function of such a differential as $D\phi p$. dp, we have only to find the function of which $D\phi p$ is the differential coefficient: but it must be observed, that the integral of a differential, as fp . dq (q a function of x) can only be found under certain conditions: for if Fp be the function of which fp is the differential co-efficient, then $fp = \dfrac{dFp}{dp}$ ∴ fp . d$q = \dfrac{dFp}{dq}$. dq ∴ if d$p = a$ dq, a an invariable quantity, the integral can be found: but if dp does not = dq, the integral cannot be found, at least not immediately: for instance, let fp . d$q = (a + bx + cx^2)^m$. (bdx + 2cxdx), then $p = a + bx + cx^2$, and ∴ dp = bdx + 2cxdx; but dq = bdx + 2cxdx, consequently the integral can be found = $\dfrac{(a + bx + cx^2)^{m+1}}{m+1}$; again let fp . d$q = (a + bx^n)^m . x^r$ dx, then $p = a + bx^n$, and d$p = nbx^{n-1}$ dx, and d$q = x^r$ dx, consequently the integral cannot be found (at least not immediately) except $r = n - 1$, or except the index of the power of the variable quantity, without the vinculum, be less by unity than the index of the power of the variable quantity under the vinculum;

again, if fp . d$q = (a + bx^n + cx^r)^m$ $(nbx^t + rcx^s)$ dx, ∴ $p = a + bx^n + cx^n$ and ∴ d$p = nbx^{t-1}$ dx + rcx_r^{-1} dx; but d$q = nbx^t$dx + rcx^s dx, consequently the integral of fp . dq cannot be assigned (at least not immediately) except $t = n - 1$, and $s = r - 1$; again, if fp . $q = e^{x^2}$. x dx, $p = x^2$, $fp = e^{x^2}$, dp = 2x dx, but d$q = x$ dx, consequently the integral of e^{x^2}, x dx can be found $\left(= \dfrac{e^{x^2}}{2}\right)$

The integrals of a^x . dx, e^x . dx, are $\dfrac{a^x}{A}$, e^x, and are obtained on the same grounds as the integrals of x^{n-1} dx, $(a + bx^n)^m . x^{n-1}$ dx, &c. are; that is, by inspection of the results, which the operation of *differentiation* performed on known functions, gives

d $(a + bx) = b$ dz, d $(a' + bx) = b$ dx,
d $(a'' + bx) = b$ dx, &c.

Hence, reversely, d^{-1} (b dx) = $a + bx$, or = $a' + bx$, or = $a'' + bx$, or = &c.

These constant quantities a, a', a'', &c. are called *corrections*, and in integrating such an expression as b dx, which of the corrections a, a', a'' is to be used, must be determined by

by the nature of the inveſtigation, in which ſuch an expreſſion as $b\,dx$ occurs.

Let $x^2 - 2ay + y^2 = 0$, then $x\,dx - a\,dy + y\,dy = 0$; but from the original equation $a = \frac{x^2 + y^2}{2y}$; and ſubſtituting

$$x\,dx - \frac{x^2 + y^2}{2y} \cdot dy + y\,dy = 0;$$

$$\text{or } 2yx\,dx - x^2\,dy + y^2\,dy = 0;$$

in which differential equation the arbitrary quantity a does not appear.

In like manner, if the equation were $x^2 - 2ay + by^2 = 0$, the firſt differential equation would be $x\,dx - a\,dy + by\,dy = 0$; the ſecond differential equation

$$x\,d^2x + dx^2 - a\,d^2y + by\,d^2y + b\,dy^2 = 0;$$

from which three equations the two arbitrary quantities a and b may be eliminated, and the reſulting differential equation will be of the ſecond order, containing neither a nor b.

Generally, ſuppoſe $\phi(x, y) = 0$, an equation between x and y, to contain arbitrary quantities a, b, c, &c. then theſe arbitrary quantities will be the ſame in the firſt, ſecond, &c. differential equations deſignated by $d\big(\phi(x, y)\big) = 0$, $d^2\big(\phi(x, y)\big) = 0$, $d^3\big(\phi(x, y)\big) = 0$, &c. Now from $\phi(x, y) = 0$, and $d\big(\phi(x, y)\big) = 0$, a conſtant quantity as a, may be eliminated, and the reſulting equation will be a differential equation of the firſt order, between x, y, $\frac{dy}{dx}$, containing a conſtant arbitrary quantity, leſs than the original equation; again, from $\phi(x, y) = 0$, $\big(\phi(x, y)\big) = 0$, $d^2\big(\phi(x, y)\big) = 0$, two conſtant quantities a and b may be eliminated, and the reſulting equation will be of the ſecond order between x, y, $\frac{dy}{dx}$, $\frac{d^2y}{dx^2}$, and containing two conſtant quantities leſs than the original or primitive equation, and ſo on.

Hence, ſince a differential equation of the firſt order may contain a conſtant quantity leſs than the primitive equation, and ſince a differential equation of the ſecond order may contain two conſtant quantities leſs than the primitive equation, &c.; reverſely, a primitive equation ought to have one more conſtant quantity than the differential equation of the firſt order, two more conſtant quantities than the differential equation of the ſecond order, and ſo on; and it cannot contain more, ſince if you ſuppoſe $\phi(x, y)$ to contain three more than the differential equation of the ſecond order, it is plain that from $\phi(x, y) = 0$, $d\big(\phi(x, y)\big) = 0$, $d^2\big(\phi(x, y)\big) = 0$, no more than two can be eliminated, conſequently one muſt remain in the equation between x, y, $\frac{dy}{dx}$, $\frac{d^2y}{dx^2}$, &c.

Theſe conſtant quantities are arbitrary, that is, they are to be expreſſed by general characters; what their values are to be muſt depend on the nature of the ſubject inveſtigated.

It does not neceſſarily happen that the primitive equation has one more conſtant quantity than the differential equation, or two more conſtant quantities than the ſecond differential equation; only as it may have, in taking the integral, you aſſign the primitive equation in its moſt general form; and if, inſtead of arbitrary quantities, it really has only $n - n'$, then the proceſs for determining the value of the arbitrary quantities will ſhew, that n' ſuch are equal to 0; hence no error or ambiguity can ariſe from introducing into the primitive equation by the proceſs of integration as many conſtant arbitrary quantities as it *can* have more than the differential equation.

Thus ſuppoſe $\frac{y\,d^2y}{dx^2} + \frac{dy^2}{dx^2} - \frac{x\,d^2y}{dx^2} - \frac{2\,dy}{dx} + 1 = 0$ (y a function of x), then integrating $\frac{y\,dy}{dx} - \frac{x\,dy}{dx} - y + x = a$,

$$\text{or } y\,dy - x\,dy - y\,dx + x\,dx = a\,dx.$$

Again, integrating $\frac{y^2}{2} - xy + \frac{x^2}{2} = ax + b$.

Now the arbitrary conſtant quantities a and b are to be determined by the nature of the ſubject of inveſtigation; ſuppoſe it ſuch, that when $x = 0$, $y = 0$, and that when $x = r$, y alſo $= r$, hence putting $x = 0$, it appears that b muſt $= 0$, ∴ equation is reduced to $y^2 - 2xy + x^2 = 2ax$, put $x = r$, then $y = r$, ∴ $r^2 - 2r^2 + r^2 = 2ar$, or $0 = 2ar$, ∴ $a = 0$, and the primitive equation is $x^2 - 2xy + y^2 = 0$; hence no error can ariſe from introducing the arbitrary conſtant quantities a and b; but in aſſigning the general form of the primitive equation, they muſt both be introduced, ſince if the conditions by which they are to be determined are altered, one or both may be retained.

It has appeared that differential equations of the firſt order have one arbitrary conſtant quantity leſs than the primitive equation; that differential equations of the ſecond order have two leſs, and ſo on; ſuppoſe now that from the equations $\phi(x, y) = 0$, $d\big(\phi(x, y)\big) = 0$, two differential equations of the firſt order are formed, the one containing a conſtant quantity a, the other a conſtant quantity b; let the firſt equation be $d(A) = 0$, the ſecond $d(B) = 0$; from $d^2(A) = 0$, and $d(A) = 0$, eliminate a, from $d^2(B) = 0$, and $d(B) = 0$, eliminate b, then the two reſulting differential equations ought to agree with one another, and with the differential equation of the ſecond order $\big(d^2(X)\big)$, obtained by eliminating a and b from the three equations $\phi(x, y) = 0$, $d\phi(x, y) = 0$, $d^2\phi(x, y) = 0$.

Hence a differential equation of the ſecond order may be derived from two differential equations of the firſt order, each containing one additional arbitrary conſtant quantity.

Hence, if for a differential equation of the ſecond order ($d^2U = 0$), we find two differential equations of the firſt order, which ſatiſfy the equation $d^2U = 0$, to wit $dX = 0$, containing an arbitrary conſtant quantity a, and $dY = 0$, containing an arbitrary conſtant quantity b, by eliminating $\frac{dy}{dx}$ from the equations $dX = 0$, $dY = 0$, there will reſult an equation between x and y, containing the two arbitrary quantities a and b, and which is the primitive or integral equation of $d^2U = 0$.

Having thus given an abſtract of the principles of analytical calculation, we ſhall now ſhew in what manner Mr. Woodhouſe applies them to ſuch inveſtigations as are uſually performed by the method of fluxions.

Inveſtigation of the Property of Curve Lines.—The curve lines, the properties of which are to be inveſtigated, are not ſuch as are generated by mechanical deſcription, but ſuch as are defined by equation, and having no exiſtence independant of what they receive from arbitrary appointment; and conſequently in deducing their properties, recourſe is to be had to the analytical expreſſions, of which

which, under certain conditions, the curves are to be made the representatives.

In a straight line, to be called the line of the absciss as, from a certain point, let a line, arbitrarily taken, be called the abscissa, and be denoted by x: at the several points corresponding to the different values of x, let straight lines be continually drawn, making a certain angle with the line of the abscissas; these straight lines are to be called ordinates, and the line or figure in which their extremities are continually found, is generally to be called a curve line.

The values of these are to be determined by an equation between y and x: thus $y = \varphi x$, and if x be increased by Δx, then by the preceding methods $y + \Delta y$ becomes $\varphi(x + \Delta x)$ or

$$y + \frac{dy}{dx} \cdot \Delta x + \frac{d^2 y}{1 \cdot 2 \cdot dx}(\Delta x)^2 + \frac{d y}{1 \cdot 2 \cdot 3 \cdot dx}(\Delta x)^3$$

+ &c. and since the value of $y + \Delta y$ is to be calculated, such series must converge. For greater simplicity in the following demonstrations the ordinates are supposed to be rightly applied.

According to the above definition of a curve line, the locus of the extremities of the ordinates must, in one instance, be a straight line; for the function φx being of the form $a x + b$ (a and b constant quantities) the extremities of all the ordinates will be found in a straight line.

There are certain propositions, it is known, relative to curves, which have not been satisfactorily established, and the want of perspicuity and accuracy in the demonstrations of such propositions is attributed to the definition that has been given of a curve line which is negative, making a curve to be that of which no portion is a straight line. Admitting, however, the foregoing definition of a curve line, which merely states it to be locus of the extremities of the ordinates, the negative definition will become a property, and capable of being demonstrated. Thus, let the interval between any two ordinates be Δx, then y being one ordinate, the next (y') separated by an interval Δx, is $y + \mathrm{D} \cdot y \cdot \Delta x + \mathrm{D}^2_c \cdot y\,(\Delta x)^2 + \mathrm{D}^3_c \cdot y\,(\Delta x)^3 +$ &c. Again, the value of another ordinate between y and $y + \Delta y$ at an interval δx ($\delta x \angle \Delta x$), is $y + \mathrm{D} \cdot y \cdot \delta x + \mathrm{D}^2_c \cdot y \cdot (\delta x)^2 +$ &c. But if the line joining the extremities of y and y' were a straight line, then $y + \mathrm{D} \cdot y \cdot \delta x + \mathrm{D}^2_c \cdot y \cdot (\delta x)^2 +$ &c. ought to $= y + \frac{\delta x}{\Delta x}$, or $y + \mathrm{D} \cdot y \cdot \delta x + \mathrm{D}^2_c \cdot y \cdot \delta x \cdot \Delta x +$ &c. which it evidently does not, except $\mathrm{D}^2_c \cdot y$, $\mathrm{D}^3_c \cdot y$, &c. $= 0$; that is, it does not, the case of the curve belonging to an equation, as $y = a x + b$ being excluded.

In order to prepare the way for the demonstrations relative to tangents, radii of curvature, lengths of curve lines, &c. it is necessary to establish this proposition, namely, that in the series $\varphi x + \mathrm{D}\,\varphi x \cdot \Delta x + \mathrm{D}^2_c\,\varphi x \cdot (\Delta x)^2$ + &c.; Δx may be taken of such a magnitude, that any term $\mathrm{D}^m_c\,\varphi x\,(\Delta x)^m$, shall be greater than the sum of all the succeeding terms.

In the method of fluxions and of limits, I have already mentioned that this proposition, or one equivalent to it, is required; for to prove that the limiting ratio of $1 : n x^{n-1} + \frac{n \cdot (n-1)}{1 \cdot 2} x^{n-2} \cdot \Delta x + \frac{n \cdot (n-1)(n-2)}{1 \cdot 2 \cdot 3} x^{n-3} \cdot (\Delta x)^2$ + &c. is $1 : n x^{n-1}$, it is necessary to shew, that by diminishing Δx, the ratio may be brought nearer to the ratio $1 : n x^{n-1}$, than by any assignable quantity, and consequently it is necessary to shew within what limits the magnitude of the rejectaneous quantity $\frac{n \cdot \overline{n-1}}{1 \cdot 2} \cdot x^{n-2} \cdot \Delta x + \frac{n \cdot \overline{n-1} \cdot \overline{n-2}}{1 \cdot 2 \cdot 3} x^{n-3} \cdot (\Delta x)^2 +$ &c. is contained; φx being a function of x, when x is increased to $x + \Delta x$, $\varphi(x + \Delta x)$ expanded, becomes $\varphi x + \mathrm{D}\,\varphi x \cdot \Delta x +$ &c. $+ \mathrm{D}^n_c\,\varphi x \cdot (\Delta x)^n + \mathrm{D}^{n+1}_c\,\varphi x \cdot (\Delta x)^{n+1} +$ &c. Now if there are two successive terms $\mathrm{D}^n_c\,\varphi x \cdot (\Delta x)^n$, $\mathrm{D}^{n+1}_c\,\varphi x \cdot (\Delta x)^{n+1}$ such, that $\frac{\mathrm{D}^{n+1}_c\,\varphi x}{\mathrm{D}^n_c\,\varphi x}$ is greater than $\frac{\mathrm{D}^{r+1}_c\,\varphi x}{\mathrm{D}^r_c\,\varphi x}$, whatever r is, then Δx may be taken so small, that any term, as $\mathrm{D}^m\,\varphi x \cdot (\Delta x)^m$, shall be greater than the sum of all succeeding terms; for take $\Delta x \angle \frac{\mathrm{D}^n_c\,\varphi x}{2 \cdot \mathrm{D}^{n+1}_c\,\varphi x}$, then $\mathrm{D}^n_c\,\varphi x \cdot (\Delta x)^n + \mathrm{D}^{n+1}_c\,\varphi x \cdot (\Delta x)^{n+1}$ is $\angle\, \mathrm{D}^n_c\,\varphi x \cdot (\Delta x)^n\,(1 + \tfrac{1}{2})$.

Again, $\mathrm{D}^m_c\,\varphi x \cdot (\Delta x)^m + \mathrm{D}^{m+1}_c\,\varphi x \cdot (\Delta x)^{m+1}$ is $\angle\, \mathrm{D}^m_c\,\varphi x \cdot (\Delta x)^m\,(1 + \tfrac{1}{2})$, and so on, every term being less than half the preceding term, and consequently, $\mathrm{D}^m_c\,\varphi x \cdot (\Delta x)^m + \mathrm{D}^{m+1}_c\,\varphi x \cdot (\Delta x)^{m+1} + \mathrm{D}^{m+2}_c\,\varphi x \cdot (\Delta x)^{m+2}$ + &c. is $\angle\, \mathrm{D}^m_c\,\varphi x \cdot (\Delta x)^m\,(1 + \tfrac{1}{2} + \frac{1}{2^2} + \frac{1}{2^3} +$ &c.); consequently, $\angle\, \mathrm{D}^m_c\,\varphi x \cdot (\Delta x)^m \left(\frac{1}{1 - \frac{1}{2}}\right)$ or $\mathrm{D}^m_c\,\varphi x \cdot (\Delta x)^m \cdot 2$; and therefore the sum of terms after $\mathrm{D}^m_c\,\varphi x \cdot (\Delta x)^m$ must be less than $\mathrm{D}^m_c\,\varphi x \cdot (\Delta x)^m$.

The proposition then will be demonstrated if it can be shewn that $\frac{\mathrm{D}^{n+1}_c\,\varphi x}{\mathrm{D}^n_c\,\varphi x}$, however great n, is never greater than a finite assignable quantity; and in order to ascertain this point, reference must be made to the particular expressions comprehended under the generic symbol φx; for, concerning the absolute magnitude of such a symbol, nothing, it is plain, can abstractedly be affirmed. Now φx represents x^m, a^x, $l \cdot x$, and may be made to represent functions composed of these by addition or subtraction. First, with regard to x^m, $\mathrm{D}^n_c\,\varphi x \cdot (\Delta x)^n = \mathrm{D}^n_c\,x^m \cdot (\Delta x)^m = \frac{m \cdot (m-1)(m-2) \ldots (m-(n-1))}{1 \cdot 2 \cdot 3 \ldots n} x^{m-n}$ $(\Delta x)^n$, call this term T; then the succeeding term (T′) is T $\cdot \frac{m-n}{n+1} \cdot \frac{\Delta x}{x}$, and consequently $\frac{\mathrm{D}^{n+1}_c\,\varphi x}{\mathrm{D}^n_c\,\varphi x}$ is $\frac{m-n}{n+1} \cdot \frac{1}{x}$, which quantity, it is clear, does not exceed any assignable quantity, for it $< \frac{m+n}{n+1} \cdot \frac{1}{x}$, and whatever values of n (always an integer) be taken, the quantity, namely, $\frac{m+n}{n+1} \cdot \frac{1}{x}$ must always be contained between $\frac{m}{x}$ and $\frac{1}{x}$.

Hence it follows, that Δx can be taken $< \frac{(n+1)\,x}{2 \cdot (m-n)}$, whatever

whatever n is, that is, can be taken lefs, taking the quantity at its leaft.

Let now ϕx be reprefented by a^x, then $\underset{c}{D^n} \phi x . (\Delta x)^n$, or $\underset{c}{D^n} a^x . (\Delta x)^n = \frac{A^n . a^x}{1 . 2 . 3 ...... n} . (\Delta x)^n$ (T), and confequently, next term (T) is, T . $\frac{A . \Delta x}{n + 1}$, ∴ $\frac{\underset{c}{D^{n+1}} \phi x}{\underset{c}{D^n} \phi x} = \frac{A}{n + 1}$, and all the fucceeding values of $\frac{A}{n + 1}$ after the greateft (A) continually decreafe; hence in this cafe it is clear that Δx can be taken $\angle \frac{n + 1}{2 A}$ whatever n is, or can be taken lefs than the leaft value of $\frac{n + 1}{2 A}$.

Let ϕx be reprefented by $l . x$, or $L . x$ (which functions belong to the equations $x = e^{l . x}$, $x = a^{L . x}$), then $\underset{c}{D^n} \phi x . (\Delta x)^n = \pm \frac{1}{A x^n} . (\Delta x)^n$ (T), and confequently, $\frac{D^{n+1} \phi x}{\underset{c}{D^n} \phi x} = \mp \frac{n}{(n + 1) x}$, which quantity is always between $\frac{1}{2 x}$ and $\frac{1}{x}$, and confequently, in this cafe Δx can be taken $\angle \frac{(n + 1) x}{2 n}$ whatever n is, or can be taken lefs than the leaft value of $\frac{(n + 1) x}{2 n}$.

Hence in ϕx it is true, that Δx can be taken of a magnitude fuch, that any one term, as $\underset{c}{D^m} \phi x . (\Delta x)^m$, fhall exceed the fum of all the fucceeding terms; and a fortiori fhall exceed that fum, the fmaller Δx is.

Hence too, if the functions fin. x, cof. x, are comprehended by the fymbol ϕx, the propofition will ftill be true, fince the analytical expreffions for thefe functions are formed by means of the exponential e^x.

The above propofition is true of any feries, as $A + B x + C x^2 +$ &c. in which it can be fhewn that $\frac{A_{m-1}}{A_m}$ is $\urcorner \frac{A_{r+1}}{A_r}$ whatever r is. Since, then, x (the arbitrary quantity) can be taken $\angle \frac{A_m}{2 A_{m+1}}$, there are feries in which $\frac{A_{r+1}}{A_r}$ increafes with the increafe of r, and becomes infinite; but fuch feries cannot occur in thofe cafes wherein it is neceffary to apply the propofition, *viz.* that the arbitrary quantity (x or Δx) can be taken fuch, that any one term fhall exceed the fum of all the fucceeding terms.

For inftance, if $A + B x + C x^2 +$ &c. be $1 + 1 . 2 . x + 1 . 2 . 3 . x^n +$ &c. then $\frac{A_{r+1}}{A_r} = \frac{1 . 2 . 3 .. r + 1}{1 . 2 . 3 ... r} = r + 1$, which becomes infinite when r does, and therefore x cannot be taken $\angle \frac{1}{2 . r + 1}$, but then fuch a feries can never occur, for it would be abfurd to propofe to deduce, for inftance, the value of the ordinate of a curve from a feries which cannot be made to converge.

To determine the conditions under which the contact of curves takes place.

Let y be the ordinate of a curve, and let it be expreffed by the function of the abfciffa ϕx, then x becoming $x + \Delta x$, y becomes $y + \frac{d y}{d x} . \Delta x + \frac{d^2 y}{1 . 2 . d x^2} . (\Delta x)^2 +$ &c. let u be the ordinate of another curve, and let $u = f t$, t being an abciffa taken in the fame line of the abciffas that x is in, then t becoming $t + \Delta t$, u becomes $u + \frac{d u}{d t} . \Delta t + \frac{d^2 u}{1 . 2 . d t^2} . (\Delta t)^2 +$ &c. Suppofe now the curves to have a common point, and for greater fimplicity let each abfciffa be meafured from the fame point, or let $t = x$, when $y = u$; if now $d y = d u$, then the contact between the two curves is fuch, that betweeen them no other curve drawn through the common point can pafs, except the differential ($d v$) of its ordinate (v) equals $d y$; for fuppofe it poffible, then the ordinate v', diftant from v by the interval Δx, $= v + \frac{d v}{d x} . \Delta x + \frac{d^2 v}{1 . 2 . d x^2} . (\Delta x)^2 +$ &c. and fince the courfe of the curve, of which v is the ordinate, paffes between the two other curves whofe ordinates are y and u, the difference $y' - v'$, or $\Delta y - \Delta v$, ought to be lefs than $y' - u'$, or $\Delta y - \Delta u$, however fmall Δx is, or $\left(\frac{d y}{d x} - \frac{d v}{d x}\right) . \Delta x + \left(\frac{d^2 y}{1 . 2 . d x^2} - \frac{d^2 v}{1 . 2 . d x^2}\right) . (\Delta x)^2 +$ &c. is $\angle \left(\frac{d y}{1 . 2 . d x^2} - \frac{d^2 u}{1 . 2 . d x^2}\right) . (\Delta x)^2 + \left(\frac{d^3 y}{1 . 2 . 3 d x^3} - \frac{d u}{1 . 2 . 3 d x^3}\right) . (\Delta x)^3 +$ &c. (for by hypothefis $\frac{d y}{d x} = \frac{d u}{d x}$), however fmall Δx is, or dividing by Δx, $\left(\frac{d y}{d x} - \frac{d v}{d x}\right) + a . \Delta x + b . (\Delta x)^2 +$ &c. is always $\angle a' . \Delta x + b' . (\Delta x)^2 +$ &c. (a, a', b, b', &c. being put for the co-efficients of the powers of Δx), however fmall Δx is, which is evidently impoffible, except $\frac{d y}{d x} = \frac{d v}{d x}$, or $d y = d v$; for the difference of the two expreffions, to wit, $\left(\frac{d y}{d x} - \frac{d v}{d x}\right) + (a - a)\ \Delta x + (b - b')\ (\Delta x)^2 +$ &c. may be made pofitive by taking Δx fuch, that $\frac{d y}{d x} - \frac{d v}{d x}$ fhall be greater than $(a - a')\ \Delta x + (b - b')\ (\Delta x)^2 +$ &c. which, by what has preceded, is evidently poffible; hence, between the courfes of the two curves in which the ordinates y, u, are equal, and the differentials of the ordinates, namely, $d y$, $d u$, likewife equal, no other curve drawn through the common point can pafs, except the differential of its ordinate ($d v$) equals the differential ($d y$) of the ordinate y.

Again, fuppofe $y = u$, $\frac{d y}{d x}$ or $D . y = \frac{d u}{d x}$ or $D . u$, $\frac{d^2 y}{d x^2}$ or $D^2 . y = \frac{d^2 u}{d x^2}$ or $D^2 . u$, then between thefe two curves no other curve (whofe equation is $v = \psi x$) drawn through the common point where the ordinates are equal, can pafs, except $\frac{d v}{d x} = \frac{d y}{d x}$, and $\frac{d^2 v}{d x^2} = \frac{d^2 y}{d x^2}$.

For if it be poffible, then $y' - v'$, or $(y + \Delta y) - (v + \Delta v)$ or, (fince $y = v$ by hypothefis, $\Delta y - \Delta v$, muft be $\angle \Delta y - \Delta u$, however fmall the interval (Δx) between the ordinates is; that is, putting for Δy, Δu, Δv, the feries they are equal to, to wit,

D . y

$\mathrm{D}\cdot y\cdot\Delta x+\frac{\mathrm{D}^2}{c}\cdot y\cdot(\Delta x)^2+\frac{\mathrm{D}^3}{c}\cdot y\cdot(\Delta x)^3+$ &c.

$\mathrm{D}\cdot u\cdot\Delta x+\frac{\mathrm{D}^2}{c}\cdot u\cdot(\Delta x)^2+\frac{\mathrm{D}^3}{c}\cdot u\cdot(\Delta x)^3+$ &c.

$\mathrm{D}\cdot v\cdot\Delta x+\frac{\mathrm{D}^2}{c}\cdot v\cdot(\Delta x)^2+\frac{\mathrm{D}^3}{c}\cdot v\cdot(\Delta x)^3+$ &c.

it follows that $(\mathrm{D}\cdot y-\mathrm{D}\cdot v)\,\Delta x+(\frac{\mathrm{D}^2}{c}\cdot y-\frac{\mathrm{D}^2}{c}\cdot v)\cdot(\Delta x)$ &c. muſt always be leſs than $(\frac{\mathrm{D}^3}{c}\cdot y-\frac{\mathrm{D}^3}{c}\cdot u)\cdot(\Delta x)^3+(\frac{\mathrm{D}^4}{c}\cdot y-\frac{\mathrm{D}^4}{c}\cdot u)\cdot(\Delta x)^4+$ &c. (for the two firſt terms in the difference $\Delta y-\Delta u$, to wit, $(\mathrm{D}\cdot y-\mathrm{D}\cdot u)$, $(\frac{\mathrm{D}^2}{c}\cdot y-\frac{\mathrm{D}^2}{c}\cdot u)$, by hypotheſis $=0$); but this is evidently impoſſible, except both, $\mathrm{D}\cdot y-\mathrm{D}\cdot v$, and $\mathrm{D}^2\cdot y-\mathrm{D}^2\cdot v$, $=0$; for, Δx can be taken of ſuch a magnitude that $(\mathrm{D}\cdot y-\mathrm{D}\cdot v)$ ſhall be greater than $(\frac{\mathrm{D}^2}{c}\cdot y-\frac{\mathrm{D}^2}{c}\cdot v)\,\Delta x-(\frac{\mathrm{D}^3}{c}\cdot y-\frac{\mathrm{D}^3}{c}\cdot u)\cdot(\Delta x)^2-$ &c. or (in caſe that $\mathrm{D}\cdot y=\mathrm{D}\cdot v$) that, $(\frac{\mathrm{D}^2}{c}\cdot y-\frac{\mathrm{D}^2}{c}\cdot v)$ ſhall be greater than $(\frac{\mathrm{D}^3}{c}\cdot u-\frac{\mathrm{D}^3}{c}\cdot v)\,\Delta x+(\frac{\mathrm{D}^4}{c}\cdot u-\frac{\mathrm{D}^4}{c}\cdot v)\cdot(\Delta x)^2+$ &c. and generally, if two curves whoſe equations are $y=\varphi\,x$, $u=f\,x$ have theſe conditions, that at the ſame point of the abſciſſa, $y=u$, and moreover, $\mathrm{D}\cdot y=\mathrm{D}\cdot u$, $\mathrm{D}^2\cdot y=\mathrm{D}^2\cdot u$, $\mathrm{D}^3\cdot y=\mathrm{D}^3\cdot u$, &c. $\mathrm{D}^{n-1}\cdot y=\mathrm{D}^{n-1}\cdot u$, then between theſe two curves no other curve whoſe equation is $v=\psi\,x)$, drawn through the common point, can paſs, except $\mathrm{D}\cdot v=\mathrm{D}\cdot y$, $\mathrm{D}^2\cdot v=\mathrm{D}^2\cdot y$, $\mathrm{D}^3\cdot v=\mathrm{D}^3\cdot y$, &c. and $\mathrm{D}^{n-1}\cdot v=\mathrm{D}^{n-1}\cdot y$; for, if ſuch a curve can paſs between the courſes of the two other curves, then $\Delta y-\Delta v$ muſt be leſs than $\Delta y-\Delta u$, or leſs than $(\frac{\mathrm{D}^n}{c}\cdot y-\frac{\mathrm{D}^n}{c}\cdot u)\cdot(\Delta x)^n+(\frac{\mathrm{D}^{n+1}}{c}\cdot y-\frac{\mathrm{D}^{n+1}}{c}\cdot u)\cdot(\Delta x)^{n+1}+$ &c. however ſmall Δx is; but this is impoſſible, ſince the terms of the ſeries repreſenting $\Delta y-\Delta v$ muſt involve powers of Δx leſs than $(\Delta x)^n$, except $\mathrm{D}\cdot v=\mathrm{D}\cdot y$, $\mathrm{D}^2\cdot v=\mathrm{D}^2\cdot y$, $\mathrm{D}^3\cdot v=\mathrm{D}^3\cdot y$, &c. and $\mathrm{D}^{n-1}\cdot v=\mathrm{D}^{n-1}\cdot y$; and if theſe differentials are not equal, then dividing by a certain power of Δx, $\Delta y-\Delta v$ cannot always be leſs than $\Delta y-\Delta u$, if in a ſeries, as $a+a'\cdot\Delta x+a''\cdot(\Delta x)^2+$ &c. a can be made to exceed the ſum of the ſucceeding terms; which evidently can be done by taking Δx of a proper ſmallneſs.

Theſe are the principles on which the contact of curves is founded; the contact admits of different degrees; and arranging the contacts according to different orders, there are curves which admit with a given curve only of contacts of a certain order; for inſtance, a right line is capable only of a contact of the firſt order; a circle is only capable of a contact of the ſecond order; a curve, whoſe equation is $y=a+b\,x+c\,x^2+d\,x^3$, is not capable of a contact higher than that of the third order; a curve, whoſe equation $y=a+b\,x+c\,x^2+\mathrm{d}\,x^3+e\,x^4$, is not capable of a contact higher than that of the fourth order, and ſo on; ſo that admitting theſe different degrees or orders of contact, they require a certain number of conſtant quantities, which may be called elements of contact: a contact of the firſt order will require two conſtant quantities; a contact of the ſecond, three conſtant quantities, &c.; and a contact of the mth order $(m+1)$, conſtant quantities.

As an example, let $u=a+b\,t$, which is the equation to a ſtraight line; then ſince it is to paſs through a point of the curve, $u=y$ and $t=x$, and $y=a+b\,x$, $\therefore$ $\mathrm{D}\cdot y$ or $\frac{\mathrm{d}\,y}{\mathrm{d}\,x}=b$, and $a=y-x\cdot b=y-x\cdot\mathrm{D}\cdot y$, conſequently the equation to the ſtraight line is $u=y-x\cdot\mathrm{D}\cdot y+\mathrm{D}\cdot y\cdot t$, the abſciſſa x being conſidered conſtant.

The line determined by this equation is commonly called a tangent; and, agreeably to the theory of contacts laid down, its geometrical property conſiſts in this, that no other ſtraight line can paſs between it and the curve whoſe equation is $y=\varphi\,x$: for, if poſſible, ſuppoſe a ſtraight line whoſe equation is $v=\alpha+\beta\,t$, to paſs between the curve and line, then ſince $v=y$, $t=x$, $y=\alpha+\beta\,x$, $\therefore$ $\frac{\mathrm{d}\,y}{\mathrm{d}\,x}$ or $\mathrm{D}\cdot y=\beta$, and $\alpha=y-\beta\,x=y-x\cdot\mathrm{D}\cdot y$, and the equation to the ſtraight line is $v=y-x\cdot\mathrm{D}\cdot y+\mathrm{D}\cdot y\cdot t$, which is the ſame equation as was deduced for the former ſtraight line, conſequently this latter ſtraight line coincides or becomes identical with the former.

In the equation $u=a+b\,t$, A B (*Plate* VII. *Analyſis*, *fig.* 6.) $=a$, A M $=t$, and $b=$ tangent of angle $\angle$ P T M (radius 1) but $b=\frac{\mathrm{d}\,y}{\mathrm{d}\,x}$, and conſequently T M $=\frac{y}{b}=\frac{y\,\mathrm{d}\,x}{\mathrm{d}\,y}$, and this is the value of the line T M called the ſubtangent; hence, in a given equation to a curve, find the value of $\frac{y\,\mathrm{d}\,x}{\mathrm{d}\,y}$, and make T M $=\frac{y\,\mathrm{d}\,x}{\mathrm{d}\,y}$, join T P, and the line T P is a tangent to the curve, or has the geometrical property before ſpecified.

Example.—Let $y=\varphi\,x=(2\,r\,x-x^2)^{\frac{1}{2}}$, then $\frac{\mathrm{d}\,y}{\mathrm{d}\,x}=\frac{r-x}{(2\,r\,x-x^2)^{\frac{1}{2}}}$, conſequently the ſubtangent $\frac{y\,\mathrm{d}\,x}{\mathrm{d}\,y}=y\cdot\frac{(2\,r\,x-x^2)^{\frac{1}{2}}}{r-x}=\frac{y^2}{r-x}$.

Again, let the equation be $x^3-3\,a\,x\,y+y^3=0$, then $3\,x^2\,\mathrm{d}\,x-3\,a\,x\,\mathrm{d}\,y-3\,a\,y\,\mathrm{d}\,x+3\,y^2\,\mathrm{d}\,y=0$, and conſequently, $\frac{\mathrm{d}\,x}{\mathrm{d}\,y}=\frac{3\,a\,x-3\,y^2}{3\,x^2-3\,a\,y}=\frac{a\,x-y^2}{x^2-a\,y}$, and the ſubtangent $\left(\frac{y\,\mathrm{d}\,x}{\mathrm{d}\,y}\right)=\frac{a\,x\,y-y^3}{x^2-a\,y}$.

Let a line K P be drawn perpendicular to the tangent T P, then it equals $y\,\sqrt{(1+(\mathrm{D}\cdot y)^2)}$, or $y\,\sqrt{\left(1+\left(\frac{\mathrm{d}\,y}{\mathrm{d}\,x}\right)^2\right)}$, for T M : P M :: P M : M K; $y\cdot\frac{\mathrm{d}\,x}{\mathrm{d}\,y}:y::y:y\cdot\frac{\mathrm{d}\,y}{\mathrm{d}\,x}=$ M K; P K$^2=y^2\left(\frac{\mathrm{d}\,y}{\mathrm{d}\,x}\right)^2+y^2$; P K $=y\,\sqrt{1+(\mathrm{D}\,y)^2}$, becauſe P K is ſecant to the angle M P K, whoſe tangent is $\frac{\mathrm{d}\,y}{\mathrm{d}\,x}$ and rad. 1; and conſequently, K M $=y\,\frac{\mathrm{d}\,y}{\mathrm{d}\,x}$, or $y\cdot\mathrm{D}\cdot y$; the line K P is called the normal, the line K M the ſubnormal.

Draw the line $m\,p$ parallel to M P, then $m\,p=$ M P $+$ $p\,t=y+$ P $t\times$ tan. $\angle$ P T M $=y+b\cdot\Delta x=y+\frac{\mathrm{d}\,y}{\mathrm{d}\,x}\cdot\Delta x$, or $y+\mathrm{D}\cdot y\cdot\Delta x$, but $m\,r=y+\mathrm{D}\cdot y\cdot\Delta x+\frac{\mathrm{D}^2}{c}\cdot y\cdot(\Delta x)^2+$ &c. conſequently, the difference or $p\,r=-(\frac{\mathrm{D}^2}{c}\cdot y\cdot(\Delta x)^2+\frac{\mathrm{D}^3}{c}\cdot y\cdot(\Delta x)^3+$ &c.$)$, take Δx ſuch, that the firſt term ſhall be greater than the ſum of all the ſucceeding terms, then $p\,r$ will be negative or poſitive, as $\frac{\mathrm{D}^2}{c}\cdot y$ is poſitive or negative, for $(\Delta x)^2$ is always poſitive

poſitive, conſequently if $D^2 . y$ be negative, the point r is between m and p, or the curve is ſaid to be concave to the axis; if $\frac{D^2}{c} . y$ be poſitive, the point p is between m and r, and the curve is ſaid to be convex to the axis.

Ex.—Let $y = a + bx + cx^2$, then $\frac{dy}{dx} = b + 2cx$, $\frac{d^2y}{dx^2}$, or $D^2 . y = 2c$, conſequently the curve is convex to the axis.

Again, let $y = (ax)^{\frac{1}{m}}$, then $\frac{dy}{dx} = \frac{a^{\frac{1}{m}}}{m} x^{\frac{1-m}{m}}$, and $\frac{d^2y}{dx^2}$ or $D^2 . y = a^{\frac{1}{m}} \frac{1-m}{m^2} x^{\frac{1-2m}{m}}$, conſequently if m is > 1, $D^2 . y$ is negative, and the curve is concave to the axis.

If $\frac{d^2y}{dx^2}$ or $D^2 . y = 0$, the curve is ſaid to have a point of inflexion: for, in this caſe the difference between mp and mr or $pr = \frac{D^3}{c} . y . (\Delta x)^3 + \frac{D^4}{c} . y . (\Delta x)^4 +$ &c. now take Δx ſuch, that the term $D^3 . y . (\Delta x)^3$, exceeds the ſum of the remaining, then, ſince the firſt term $D^3 . y . (\Delta x)$ changes its ſign, when Δx does, the difference pr will likewiſe change its ſign when Δx does, or, if on one ſide of the ordinate (y) the curve is convex, on the other it will be concave.

If $D^2 . y$, $D^3 . y = 0$, then the curve will not have a point of inflexion, for the difference between mp and mr will be $-(\frac{D^4}{c} . y . (\Delta x)^4 + \frac{D^5}{c} . y . (\Delta x)^5 +$ &c.), and conſequently its ſign will depend ſolely on the ſign of $D^4 . y$, and not on the ſign of Δx, for $(\Delta x)^4$ is poſitive whether Δx is poſitive or negative; and generally if $D^2 . y = 0$, $D^3 . y = 0$, $D^4 y = 0$, &c. and $D^m . y = 0$, (m even) then the curve has a point of inflexion.

It has appeared, that generally the difference

$$pr = -(\frac{D^2}{c} . y . (\Delta x)^2 + \frac{D^3}{c} . y . (\Delta x)^3 + \&c.)$$
$$= -(\Delta x)^2 (\frac{D^2}{c} . y + \frac{D^3}{c} . y . \Delta x + \frac{D^4}{c} . y . (\Delta x)^2 +$$

&c.); now ſince Δx may be taken ſo ſmall, that a term, as $\frac{D^3}{c} . y . \Delta x$, is greater than the ſum of all the ſucceeding terms, it is plain that the difference between pr and $(\Delta x)^2 . \frac{D^2}{c} . y$ or $\frac{d^2y}{1 . 2 . dx^2} . (\Delta x)^2$ may be made leſs than any aſſignable quantity: this is all that is to be underſtood in the preſent method, concerning any equality between a certain ſtate of pr and $D^2 . y . (\Delta x)^2$; in the method of fluxions, or of prime and ultimate ratios, the ultimate ratio of pr, or the ſagitta of the arc or evaneſcent ſubtenſe, is made $= \frac{d^2y}{1 . 2 . dx^2} . dx^2$; not indeed abſolutely and metaphyſically equal, but equal according to the definition of equality neceſſary to be laid down in that method.

A ſtraight line admits, it has appeared, only of a contact of the firſt order, its equation $u - a - bt = 0$, containing only two conſtant quantities. (a, b) or elements of contact: a curve whoſe equation is $u = a + bt + ct^2$, in which there are three elements of contact, or conſtant quantities, admits of a contact of the ſecond order; or its geometrical property is ſuch, that if $t = x$, $u = y$, $du = dy$, $d^2u = d^2y$, no other curve of the ſame kind can paſs between its courſe, and that of the curve whoſe equation is $y = \varphi x$.

In like manner, the equation to the circle containing only three conſtant quantities, the circle admits of no contact higher than that of the ſecond order. Although the principles on which its contact with curves depends are the principles of the general theory, and properly form no exception, yet the contact of circles may merit a particular examination, from the rank that the theory of oſculation or of circles of curvature holds in the hiſtory of ſcience: Newton was led by it to his theory of central forces.

Let the circle and curve have a common point P, then ſince $PL^2 + LO^2 = OP$, or $(PM - LM)^2 + (AN - AM)^2 = OP^2$ putting $PM = u$, LM or $ON = b$, $AN = a$, $AM = t$, $(u - b)^2 + (a - t)^2 = r^2$, and conſequently $u = b + \sqrt{(r^2 - (a - t)^2)}$: at the common point $u = y$, $t = x$, $\therefore y = b + \sqrt{(r^2 - (a - x)^2)}$ $\therefore \frac{dy}{dx}$ or $D . y = (a - x)(r^2 - (a - x)^2)^{-\frac{1}{2}}$; and ſince

LO : OP :: MK : PK

$$a - x : r :: y\frac{dy}{dx} : y \sqrt{1 + Dy^2} :: D . y : \sqrt{1 + Dy^2},$$

$$a - x = \frac{r . D . y}{\sqrt{1 + Dy^2}}$$

but PL : PO :: PM : PK

$$y - b : r :: y : y \sqrt{1 + (Dy)^2}$$

$$y - b = \frac{r}{1 + (Dy)^2}$$

hence, $a = x + \frac{r . D . y}{\sqrt{(1 + (D . y)^2)}}$ and $b = y - \frac{r}{\sqrt{(1 + (D . y)^2)}}$, and conſequently, in terms of y or x, the co-ordinates a and b, by which the centre is determined, are expreſſed.

The elements a and b, on which the degree of contact depends, have been determined on theſe two conditions, *viz.* that $u = y$, and that $\frac{du}{dx} = \frac{dy}{dx}$, and agreeably to the theory laid down, the circle whoſe radius is r, and the poſition of whoſe centre is determined by the values of the co-ordinates deduced as above, is ſuch, that between it and the curve no other circle of the ſame radius can be drawn, having its centre placed differently.

For if poſſible, let the equation to ſuch a circle be $(v - \beta)^2 + (\alpha - t)^2 = r^2$ or $v = \beta + \sqrt{(r^2 - (\alpha - t)^2)}$, at the common point $v = y$, hence, α and β are to be determined from the equations $y = \beta + \sqrt{(r^2 - (\alpha - x)^2)}$ and $D . y = (\alpha - x)(r^2 - (\alpha - x)^2)^{-\frac{1}{2}}$, which equations are exactly ſimilar to thoſe from which a and b were determined: conſequently α and β deduced, will be expreſſed by the ſame quantities as a and b are, or the new circle will become identical, or coincide, with the former.

Since the concluſions deduced as above do not depend on the magnitude of r, ſuppoſe it indeterminate in the expreſſions for a and b; then ſince from one expreſſion r equals $\frac{(a - x)\sqrt{(1 + (D . y)^2)}}{D . y}$ and from the other $(y - b) \sqrt{(1 + (D . y)^2)}$, equate the two values, and there reſults $a - x = (y - b) . D . y$, or $b = y + \frac{x - a}{D . y}$ an equation to a right line in which are placed the centres of all the

circles

circles that touch the curve, that is, that have with it a contact of the first order.

The value of the subnormal has been found $= y \cdot D \cdot y$ and the tangent of the angle which the normal makes with the axis is $\frac{1}{D \cdot y}$, suppose now P K to be the normal, then the equation to it, considered as a right line is (since $PM = PL + ON = MN \times$ tangent $\angle PKM + ON$) $y = \frac{a - x}{D \cdot y} + b$, consequently, $b = y + \frac{x - a}{D \cdot y}$, the same equation as has been just deduced for the right line in which the centres of all the circles that touch the curve are placed: hence, this right line coincides with the normal, and is consequently perpendicular to the tangent of the curve.

Suppose it now were required, from all the circles which touch the curve, that is, which satisfy these conditions, *viz.* $y = u$, $\frac{dy}{dx} = \frac{du}{dx}$, to select that which has with the given curve a contact, such, that between it and the curve no other circle can be drawn, or which, analytically speaking, satisfies the condition $\frac{d^2 y}{dx^2} = \frac{d^2 u}{dx^2}$: now, by what has preceded,

$$a = x + \frac{r \cdot D \cdot y}{\surd\left(1 + (D \cdot y)^2\right)}, \text{ and } b = y - \frac{r}{\surd\left(1 + (D \cdot y)^2\right)};$$

again, $\frac{d^2 y}{dx^2}$ or $D^2 \cdot y = \frac{1}{dx} \cdot d\left(\frac{dy}{dx}\right) = \frac{1}{dx} \cdot d$

$$\left(\frac{a - x}{\surd\left(r^2 - (a - x)^2\right)}\right) = -\frac{r^2}{\left(r^2 - (a - x)^2\right)^{\frac{3}{2}}} = -$$

$$\frac{r^2}{\left(r^2 - \frac{r^2 \cdot (D \cdot y)^2}{1 + (D \cdot y)^2}\right)^{\frac{3}{2}}} = -\frac{\left(1 + (D \cdot y)^2\right)^{\frac{3}{2}}}{r}$$

and consequently, $r = \frac{\left(1 + (D \cdot y)^2\right)^{\frac{3}{2}}}{-D^2 \cdot y}$ or $= \frac{(dx^2 + dy^2)^{\frac{3}{2}}}{-dx \cdot d^2 y}$

and $a = x - \frac{D \cdot y \cdot \left(1 + (D \cdot y)^2\right)}{D^2 \cdot y}$ or $= -\frac{dy \cdot (dx^2 + dy^2)}{dx \cdot d^2 y}$,

and $b = y + \frac{1 + (D \cdot y)^2}{D^2 \cdot y}$ or $= y + \frac{dx^2 + dy^2}{d^2 y}$.

By these equations are determined the co-ordinates of the centre of a circle, and the radius of that circle which is such, that between it and the curve no other circle can pass; for, if it be possible for another circle to pass between the curve and the former circle, let its equation be $v = \beta + \surd\left(\varrho^2 - (\alpha - t)^2\right)$, then the three elements of contact, to wit, α, β, ϱ, are to be determined from the three equations

$$y = \beta + \surd\left(\varrho^2 - (\alpha - x)^2\right), \; D \cdot y = (\alpha - x)$$

$$\left(\varrho^2 - (\alpha - x)^2\right)^{-\frac{1}{2}} \text{ and } D^2 \cdot y = -\frac{\varrho^2}{\left(\varrho^2 - (\alpha - x)^2\right)^{\frac{3}{2}}},$$

which equations are exactly similar to the equations by which the elements a, b, r were determined; consequently, after elimination, α, β, ϱ will be exhibited by the same forms as a, b, r have been exhibited; or in other words, the new circle will become identical with the former.

Let it now be required to investigate an expression from which the areas of curves may be found. Suppose y the ordinate of the curve, then at an interval Δx the ordinate is $y + \Delta y = y + D \cdot y \cdot \Delta x + D^2_c \cdot y \cdot (\Delta x)^2 + \&c.$ and the incremental area between the ordinates y and $y + \Delta y$ is $> y \cdot \Delta x$, and $< (y + \Delta y) \cdot \Delta x$, the ordinates increasing, or $< y \cdot \Delta x$, and $> (y + \Delta y) \cdot \Delta x$; the ordinates diminishing; let now the area be represented by $fx = u$, a function of the abscissa, then $f \cdot (x + \Delta x) - fx$, or Δu is between the limits $(y + \Delta y) \cdot \Delta x$, and $y \cdot \Delta x$; hence $\Delta u - y \cdot \Delta x$ must always be less than $(y + \Delta y) \cdot \Delta x - y \cdot \Delta x$, however small Δx is, or putting for Δu, Δy their expanded series, $(D \cdot u - y) \cdot \Delta x + D^2_c \cdot u (\Delta x)^2 + \&c.$ is $< \Delta y \cdot \Delta x$, or $< D \cdot y \cdot (\Delta x)^2 + D^2_c \cdot y \cdot (\Delta x)^3 + \&c.$ and consequently $(D \cdot u - y) + D^2_c \cdot u \cdot \Delta x + \&c.$ must be $< D \cdot y \cdot \Delta x + D^2_c \cdot y \cdot (\Delta x)^2 + \&c.$ however small Δx is, which is evidently impossible, except $D \cdot u - y = 0$; for the difference of the two expressions being $(D \cdot u - y) + (D^2_c \cdot u - D \cdot y) \cdot \Delta x + (D^3_c \cdot u - D^2_c \cdot y) \cdot (\Delta x)^2 + \&c.$ it is evident that Δx may be taken such, that $(D \cdot u - y)$ shall be greater than the sum of all the succeeding terms; hence $D \cdot u - y$ or $\frac{du}{dx} = y$ or $du = y\,dx$; and consequently $d^{-1}(du)$ or $u = d^{-1}(y\,dx)$.

Hence to find the area is merely an analytical question, the ordinate being given a function of the abscissa; what is to be done, is, the determination of the integral of a given differential expression.

If $y = a + bx^n + cx^r$, $du = a\,dx + bx^n\,dx + cx^r\,dx$, and $u = ax + \frac{bx^{n+1}}{n+1} + \frac{cx^{r+1}}{r+1} + \alpha$, α being an arbitrary quantity, which in specific cases may be determined.

The differential expression from which the solidity of a body is to be calculated, may be thus obtained.

Let fx be a section of the solid, made perpendicular to the axis; let s, a function of the abscissa, represent the solidity, then Δs is contained between the limits $f(x + \Delta x)$ Δx, and $fx \cdot \Delta x$, consequently $\Delta s - fx \cdot \Delta x$ is $< \left(f(x + \Delta x) - fx\right) \cdot \Delta x$, or $(D \cdot s - fx) \cdot \Delta x + D^2_c s \cdot (\Delta x)^2 + \&c.$ is $< D fx \cdot (\Delta x)^2 + D^2_c fx \cdot (\Delta x)^3 + \&c.$ and consequently, $(D \cdot s - fx) + D^2_c s \cdot \Delta x + \&c. < D fx \cdot \Delta x + D^2 fx \cdot (\Delta x)^2 + \&c.$ however small Δx be taken, which is impossible, except $D \cdot s - fx = 0$, since Δx may be taken so small, that $(D fx - D^2_c \cdot s) \Delta x + a \cdot (\Delta x)^2 + a' \cdot (\Delta x)^3 + \&c.$ (putting a, a' &c. for the co-efficients of the terms affected with $(\Delta x)^2$, $(\Delta x)^3$, &c.) is less than $D \cdot s - fx$, and à fortiori less for all smaller values of Δx; hence $D \cdot s = fx$, or $\frac{ds}{dx} = fx$, or $ds = fx \cdot dx$: if the solid can be conceived to be generated by the revolution of a figure round its axis, the section, the area of which is represented by fx, is a circle, consequently if y be its radius, $p = 3.14159 + \&c.$ $fx = py^2$, and thence $ds = py^2\,dx$, and $s = d^{-1}(py^2\,dx)$.

The differential expression next to be deduced is that on which the rectification of curves depends, or from which their lengths may be calculated. The expression may easily be deduced if the assumption of Archimedes be admitted, which is nearly as follows, that of lines having the same terminations, that which is a right line is the least, and if two figures have the same straight line for their base, that which is contained within the other, if it is always concave towards the base, is the least; from which it immediately follows that the arc M, M′, M″, (*fig.* 7.) is greater than the chord drawn from m to M″, and less than $Mq + qM''$; the limits within

within which the arc is contained being determined, the differential expression by which its length is to be calculated may be obtained thus:

Draw M Z perpendicular to Z P; let M′ r, M t, t Q, be tangents, then the arc M M′ 7 chord M M is 7 M′ r (supposing M r produced to cut the axis to the left of M P′; again, arc M M Q is $\angle$ M t + t Q, but arc M′ Q is > t Q (for same reason as arc M M′ is > M′ r); consequently arc M M′ is < M t and > M′ r; now if P P be Δx, $M t = \Delta x \sqrt{(1 + (D \cdot y)^2)}$ and calling P′ M′, y′, $M' r = \Delta x \sqrt{(1 + (D \cdot y')^2)}$, therefore arc M M′, or supposing z a function of x to represent the arc, Δz is $< \Delta x \sqrt{(1 + (D \cdot y)^2)}$, $> \Delta x \sqrt{(1 + (D \cdot y')^2)}$, and consequently

$$\Delta x \sqrt{(1 + (D \cdot y)^2)} - \Delta z \text{ ought to be}$$

$$< \Delta x \sqrt{(1 + (D \cdot y^2)} - \Delta x \sqrt{(1 + (D \cdot y')^2)}$$

but $\Delta z = D \cdot z \cdot \Delta x + \frac{D^2}{c} z \cdot (\Delta x)^2 + \&c.$

$y' = y + D \cdot y \cdot \Delta x + \frac{D^2}{c} y \cdot (\Delta x)^2 + \&c.$ consequently $D \cdot y' = D \cdot y + \frac{D^2}{c} \cdot y \cdot \Delta x + \frac{D^3 \cdot y}{1 \cdot 2} \cdot (\Delta x)^2 + \&c.$ and $\sqrt{(1 + (D \cdot y')^2)} = \sqrt{(1 + (D \cdot y)^2)} + 2 \cdot D \cdot y \, (D^2 \cdot y \cdot \Delta x + \frac{D^3 \cdot y}{1 \cdot 2} \cdot (\Delta x)^2 + \&c.) = \sqrt{(1 + (D \cdot y)^2)} + a \cdot \Delta x + (\Delta x)^2 + \&c.$ putting a, a′ &c. for the co-efficients of Δx. $(\Delta x)^2$, &c hence

$\left(\sqrt{(1 + (D \cdot y)^2)} - D \cdot z\right) \Delta x - \frac{D^2}{c} \cdot z \cdot (\Delta x)^2 - \frac{D^3}{c} \cdot z \cdot (\Delta x)^3 - \&c.$ must be $< a \cdot (\Delta x)^2 + a' \cdot (\Delta x)^3 + \&c.$ or

$\left(\sqrt{(1 + (D \cdot y)^2)} - D \cdot z\right) - \frac{D^2}{c} \cdot z \cdot \Delta x - \&c. < a \cdot \Delta x + a' \cdot (\Delta x)^2 + \&c.$ however small Δx is, but, as it has been shewn in preceding cases, this is impossible, except $\sqrt{(1 + (D \cdot y)^2)} - D \cdot z = 0$; consequently, since the difference between the arc and one of its limits must be less than the difference between the limits, $\sqrt{(1 + (D \cdot y)^2)} - D \cdot z$ must be $= 0$, or $D \cdot z = \sqrt{(1 + (D \cdot y)^2)}$,

$$\text{or } \frac{d\,z}{d\,x} = \sqrt{\left(1 + \left(\frac{d\,y}{d\,x}\right)^2\right)}$$

$$\text{or } d\,z = \sqrt{(d\,x^2 + d\,y^2)}.$$

Ex. 1.—Let $a^{\frac{1}{2}} y = x^{\frac{3}{2}}$, then $d\,y = \frac{3}{2\sqrt{a}} x^{\frac{1}{2}} . d\,x$, and $d\,y^2 = \frac{9}{4a} x\,d\,x^2$, and $d\,x^2 + d\,y^2 = \frac{d\,x^2}{4a} (4\,a + 9\,x)$, consequently, $d\,z = \sqrt{(d\,x^2 + d\,y^2)} = \frac{d\,x}{2\sqrt{a}} \sqrt{(4a + 9\,x)}$, and integrating $z = \frac{(4a + 9\,x)^{\frac{3}{2}}}{27\sqrt{a}} + \alpha$, α being an arbitrary quantity called the correction; if $z = A$, when $x = r$, then $A = \frac{(4\,a + 9\,r)^{\frac{3}{2}}}{27\sqrt{a}} + \alpha$, consequently, $= A - \frac{(4\,a + 9\,r)^{\frac{3}{2}}}{27\sqrt{a}}$.

Ex. 2.—Let $y = \sqrt{(1 - x^2)}$, $\therefore d\,y = \frac{-x\,d\,x}{-\sqrt{1 - x^2}}$, $d\,y^2 = \frac{x^2 \cdot d\,x^2}{1 - x^2}$, and $d\,x^2 + d\,y^2 = d\,x^2 + \frac{x^2 \cdot d\,x^2}{1 - x^2} = \frac{d\,x^2}{1 - x^2}$, consequently, $d\,z\ \frac{d\,x}{\sqrt{(1 - x^2)}} =$ (by expansion), $d\,x\,(1^{-\frac{1}{2}} - D\,1^{-\frac{1}{2}} . x^2 + \frac{D^2}{c} 1^{-\frac{1}{2}} . x - \&c.)$ (in which $D\,1^{-\frac{1}{2}}$, $\frac{D^2}{c} 1^{-\frac{1}{2}}$, &c. are used as symbols, signifying respectively $-\frac{1}{2}$, $\frac{3}{8}$, &c) and $z = x - \frac{D\,1^{-\frac{1}{2}} . x^3}{3} + \frac{D^2}{c} 1^{-\frac{1}{2}} \frac{x^5}{5} + \&c. + \alpha$, or $= x + \frac{x^3}{2 \cdot 3} + \frac{3\,x^5}{5 \cdot 8} + \&c. + \alpha$, ($\alpha$ an arbitrary constant quantity).

Let it now be required to investigate the differential expression from which the surface of a solid may be deduced.

It has been shewn that the arc M M′ is $\angle$ M t > M′ r: now if the figure be conceived to revolve round T P, then P T, P M′ describe circles, M t, M′ r conical surfaces, and M M′ a conoidal surface, which will be contained between the conical surfaces generated by M t, M r; now the conical surface belonging to $M t = \frac{1}{2} (2p . P\,t + 2p . P\,M)\ M t$ ($p = 3.14159 + \&c.$) $= p . M t\,(P' t + P\,M)$, and the conical surface belonging to $M\,r = p . M' r\,(M\,P' + P\,r)$, now $P\,t = y + D . y . \Delta x$, $P\,r = y' - D . y' . \Delta x$, $M t = \Delta x \sqrt{(1 + (D . y)^2)}$, $M' r = \Delta x \sqrt{(1 + (D . y')^2)}$, let the expression $\sqrt{(1 + (D . y)^2)} = \psi\,x$, then since y′ is what y becomes, putting for x, $x + \Delta x$ $\sqrt{(1 + (D . y')^2)} = \psi\,(x + \Delta x)$; hence the surface is $< p . \Delta x . \psi\,x\,(2y + D\,y . \Delta x)$, $> p . \Delta x . \psi\,(x + \Delta x) . (2y' - D\,y' . \Delta x)$, let the function of x representing the surface be V, then the portion belonging to $M\,M' = \Delta V = D\,V . \Delta x + \frac{D^2}{c} V . (\Delta x)^2 + \frac{D^3}{c} V . (\Delta x)^3 + \&c.$ hence this latter quantity being constantly contained between the two limits above-mentioned, the difference between it and one of the limits must be less than the difference between the limits, or $p . \psi\,x\,((2y + D . y . \Delta x) - D . V)\ \Delta x - \frac{D^2}{c} V . (\Delta x)^2 - \&c. < p . \Delta x \left\{ \psi\,x\,(2y + D . y . \Delta x) - \psi\,(x + \Delta x) . (2y' - D\,y' . \Delta x) \right\}$ or $(p . \psi\,x . 2y - D . V) . \Delta x + a . (\Delta x)^2 + b . (\Delta x)^3 + \&c. < a' . (\Delta x)^2 + b' . (\Delta x)^3 + \&c.$ (a, a′, b, b′, &c. representing co-efficients affected with powers of Δx) for since $\psi\,(x + \Delta x) = \psi\,x + D\,\psi\,x\ \Delta x + \frac{D^2}{c} \psi\,x . (\Delta x)^2 + \&c.$ and $2\,y' = 2\,y + 2\,D . y . \Delta x + \&c.$ the first term in the expanded series, for $\psi\,(x + \Delta x)\,(2y' - D\,y' . \Delta x) = 2\,y . \psi\,x =$ first term in the expanded series for $\psi\,x\,(2\,y + D . y . \Delta x)$, and hence it follows, that the first term in $p . \Delta x \left\{ \psi\,x . (2y + D . y . \Delta x) - \psi\,(x\,\Delta + x)\,(2\,y' - D . y' . \Delta x) \right\}$ contains $(\Delta x)^2$; consequently, since the difference between the limit and D . V, or $(p . \psi\,x . 2\,y - D . V) . \Delta x + a . (\Delta x)^2 + \&c.$ must be less than the difference between the limits, of the form $a' (\Delta x)^2 + b' (\Delta x)^3 + \&c.$ however small Δx is, this cannot happen except $p . \psi\,x . 2\,y - D . V = 0$, or $p . \psi\,x . 2\,y = \frac{d\,V}{d\,x}$, or $p . \sqrt{(1 + (D . y)^2)} . 2\,y = \frac{d\,V}{d\,x}$, or $p . \sqrt{(d\,x^2 + d\,y^2)} . 2\,y = d\,V$, or calling $\sqrt{(d\,x^2 + d\,y^2)}$, $d\,z$, $d\,V = 2\,p\,y\,d\,z$, the differential expression from which the surface is to be found.

If $y^2 = a\,x$, $d\,x^2 = \frac{4\,y^2 . d\,y^2}{a^2}$, and $\sqrt{(d\,x^2 + d\,y^2)} =$

d y

$\frac{dy\sqrt{(a^2+4y^2)}}{a}$, and $dV = \frac{2p}{a}y\,dy\sqrt{(a^2+4y^2)}$, consequently $V = \frac{2p}{a} \cdot \frac{(a^2+4y^2)^{\frac{3}{2}}}{12} = \frac{p}{6a}(a^2+4y^2)^{\frac{3}{2}} + \alpha$, ($\alpha$ being a conftant arbitrary quantity).

The manner in which Mr. Woodhoufe applies thefe principles to explain fome propofitions in the doctrine of motion, is particularly deferving of attention, as it is the converfe method to that moft ufually followed by fluxionary writers.

The laws of motion are here beautifully illuftrated from principles derived by fair induction from the proceffes of common algebra, whereas, thofe writers ufually purfue a method entirely the reverfe, and inftitute algebraical proceffes from the theory of motion.

To determine the circumftances under which a function ϕx admits of a maximum or minimum,

Let x be increafed by Δx; then $\phi(x+\Delta x) = \phi x + D\phi x \cdot \Delta x + D^2_c \phi x \cdot (\Delta x)^2 +$ &c. or $y + D \cdot y \cdot \Delta x + D^2_c \cdot y (\Delta x)^2 +$ &c.; now in cafe of a maximum y is $> y + \Delta y$, or $> y + D \cdot y \cdot \Delta x + D^2_c \cdot y \cdot (\Delta x)^2 +$ &c.; and in cafe of a minimum $< y + D \cdot y \cdot \Delta x + D^2_c \cdot y \cdot (\Delta x)^2 +$ &c., or $D \cdot y \cdot \Delta x + D^2_c \cdot y \cdot (\Delta x) +$ &c. is < 0 in cafe of a maximum, and > 0 in cafe of a minimum, whatever Δx is; now Δx may be taken fuch, that the firft term, to wit, $D \cdot y \cdot \Delta x$ is greater than the reft of all the fucceeding terms; confequently $D \cdot y \cdot \Delta x + D^2_c \cdot y \cdot (\Delta x)^2 +$ &c. is > 0, or < 0, accordingly as $D \cdot y \cdot \Delta x$ is pofitive or negative: but $D \cdot y \cdot \Delta x$ changes its figns with Δx, confequently, taking Δx, $+\Delta x$, and $-\Delta x$, $D \cdot y \cdot \Delta x + D^2_c \cdot y \cdot (\Delta x)^2 +$ &c. cannot be always < 0, in cafe of the maximum, nor > 0 in cafe of the minimum, except $D \cdot y = 0$; hence, when y or ϕx is at a ftate of maximum or minimum, $D \cdot y$ or $\frac{dy}{dx} = 0$.

Again, fince the co-efficient $D \cdot y$ or $\frac{dy}{dx} = 0$, then $D^2_c \cdot y \cdot (\Delta x)^2 + D^3_c \cdot y \cdot (\Delta x)^3 +$ &c. muft be < 0 in cafe of a maximum, and > 0 in cafe of a minimum: take Δx fuch that the firft term, namely, $D^2_c \cdot y \cdot (\Delta x)^2$, is greater than the fum of all the fucceeding terms; then fince $(\Delta x)^2$ is pofitive, whether Δx be pofitive or negative, $D^2_c \cdot y \cdot (\Delta x)^2 + D^3_c \cdot y \cdot (\Delta x)^3 +$ &c. is < 0 or > 0, accordingly as $D^2_c \cdot y$ or $\frac{d^2y}{dx^2}$ is negative or pofitive; hence, for a maximum $D^2_c y$ is negative, for a minimum, pofitive.

Next, fuppofe the co-efficients $D \cdot y$, $D^2 \cdot y$, both to equal 0, then $D^3_c \cdot y \cdot (\Delta x)^3 + D^4_c \cdot y (\Delta x)^4 +$ &c. is < 0 for a maximum, and > 0 for a minimum; take Δx fuch that the firft term $D^3 y (\Delta x)^3$ is greater than the fum of all the fucceeding terms; then fince $D^3_c \cdot y \cdot (\Delta y)^3$ changes its fign as Δx does, $D^3_c \cdot y \cdot (\Delta x)^3 + D^4_c \cdot y (\Delta x)^4 +$ &c. cannot always < 0 for a maximum, nor > 0 for a minimum, except $D^3_c \cdot y = 0$, or $\frac{d^3y}{dx^3} = 0$.

And generally, if $D \cdot y$, $D^2 \cdot y$, $D^3_c \cdot y$, &c. $D^m \cdot y$ (m even) $= 0$; then that the function y, (ϕx) may admit a maximum or minimum, $D^{m+1} \cdot y$ muft alfo be $= 0$; and for a maximum $D^{m+2} \cdot y$ muft be negative, and for a minimum pofitive.

Such are the methods for determining the maxima and minima of quantities; the principles on which they are founded are fufficiently evident, and merely analytical examples cannot illuftrate them.

It was in attempting the folution of thefe problems *de maximis et minimis*, that the differential calculus is faid to have originated. Fermat is the firft writer who has given a method purely analytical. His method confifts in making the quantity whofe maximum or minimum is fought equal to the expreffion of the fame quantity, in which the unknown quantity is augmented by an indeterminate quantity: in this equation he makes the radicals and fractions, if any difappear, and having exterminated the common terms on each fide of the equation, he divides the others by the indeterminate quantity by which they are multiplied; then he makes this quantity *zero*, and obtains an equation which ferves to determine the unknown quantity. The following fimple example will ferve to illuftrate the method of Fermat.

Let it be required to divide a right line into two parts, in fuch a manner that the rectangle contained by the two parts may be a maximum.

Let a be the given line, x one part, and $a - x$ the other. The expreffion $ax - x$ is then to be a maximum. Add the arbitrary quantity e to the unknown quantity x, and we obtain this new expreffion,

$$a(x+e) - (x+e)^2.$$

Thefe expreffions being fuppofed equal

$$ax - x^2 = a(x+e) - (x+e)^2,$$

$$\text{or } ax - x^2 = ax + ae - x^2 - 2ex - e^2,$$

fubtract $a - x^2$ from each fide, and divide by e

$$a - 2x - e = 0:$$

now fuppofe $e = 0$, then $a - 2x = 0$, and $x = \frac{a}{2}$.

This is the fame refult as obtained by the fluxional or differential method, and the bafis on which they are all founded is very fimilar. The terms which are rejected as infinitely fmall by fome writers on the infinitefimal calculus, are here fuppreffed, as vanifhing or becoming zero in the method by Fermat. His method of drawing tangents depends on the fame principle; in the equation between the abfciffa and the ordinate, which Fermat calls the fpecific property of the curve, he augments or diminifhes the abfciffa by an indeterminate quantity, and he regards the new ordinate as belonging at once to the curve and tangent, which produces an equation which he treats as in the above method *de maximis et minimis*.

Thus x being the abfciffa and y the ordinate, if t is the fubtangent at the point of the curve which anfwers to x and y, then by fimilar triangles $\frac{y(t+e)}{t}$ for the ordinate to the tangent relative to the abfciffa $x + e$; and this ordinate fhould be equal to that of the curve for the fame abfciffa $x + e$: we fhall therefore have the required equation, if in the equation for the curve we fubftitute $x + e$ in the place of x and $y + \frac{ye}{t}$ in the place of y.

This equation will be divifible by e; all its terms then are to be divided by e, and afterwards thofe fuppreffed in which the indeterminate quantity e is found, becaufe this indeterminate quantity is fuppofed now to become zero. The remaining equation will give the value of t in the terms of x and y. Thus in the parabola for example, whofe

whose equation $y^2 - a x = 0$, substituting $y + \frac{y e}{t}$ for y, and $x + e$ for x, the equation becomes

$$y^2 + \frac{2 y^2 e}{t} + \frac{y^2 e^2}{t^2} - a x - a e = 0.$$

But $y^2 - a x = 0$; therefore rejecting these terms, and dividing others by e,

$$\frac{2 y^2}{t} + \frac{y^2 e}{t^2} - a = 0$$

rejecting the second term, e being now supposed $= 0$,

$$t = \frac{2 y^2}{a} = 2 x.$$

We may here likewise trace the analogy between the method of Fermat and the differential calculus; for the indeterminate quantity e, by which x is augmented, answers to the differential $\mathrm{d}\, x$; and $\frac{y e}{t}$, the corresponding augmentation of y, answers to its differential $\mathrm{d}\, y$.

This idea of Fermat seems to have been original, but somewhat obscure. It consists in introducing into an equation an indeterminate quantity, which is afterwards supposed to become zero, by the conditions of the problem, but which is not made to vanish till the whole equation has been divided by it. This idea may be considered as the germ of the *new calculus*, by which such rapid advances have been made in geometry and mechanics. But the obscurity of its origin still remains a blemish in the elementary principles, as delivered by most writers on this subject. They are all liable to the objection, urged by Berkly, of a *shifting of hypothesis*; that is, equations are established upon the supposition of a symbol having an actual existence as a quantity, and consequences are then established which are presumed to hold good, when the hypothesis is entirely changed by making the symbol equal to zero.

The cotemporaries of Fermat did not enter into the spirit of this mode of calculation, they considered it as only a particular artifice, applicable to a few cases, and subject to many difficulties. In the third volume of the letters of Descartes may be seen a long dispute with Fermat upon this subject. Thus this invention, which appeared a short time previous to the *geometrie de Descartes*, remained dormant and neglected for above forty years.

At length Barrow contrived to substitute for these vanishing quantities of Fermat others supposed infinitely small. In 1674, he gave his method of tangents, which is only a geometrical construction of the method of Fermat, by means of a triangle infinitely small, formed by the sides e and $\frac{e y}{t}$, and by an infinitely small side of the curve supposed a polygon. With him originated the system of infinitesimal quantities, from which arose the differential calculus.

But to return to the subject. Questions relating to the maxima and minima of quantities were not unknown to the ancient geometricians. One entire book of Apollonius is devoted to the investigation of the longest and shortest lines that can be drawn from a given point to the arcs of conic sections. The method of Apollonius is reduced simply to the proof, that every other straight line drawn to the conic section is less in case of the maximum, and greater in that of the minimum, than that which he has determined, and this method has since been generally followed by all those who have endeavoured to solve these problems by simple geometry.

Fermat, as above stated, was the first who attempted to solve them analytically. His method, simplified and generalized by the fluxionary and differential calculus, consists in making the differential or fluxion of the function, which is to be a maximum or minimum, equal to zero. Most of the methods we have been treating of derive their origin from the consideration of curve lines; the determination of the greatest and least ordinates in curved lines and surfaces gave rise to the above questions of *maxima* and *minima*. But there is a species of problems, related to these, of a much more difficult and general nature, and though our limits will not permit us to devote a very great portion of this work to them, yet we would not willingly omit a general illustration of the principle on which they depend. The problem of the *swiftest descent* is of this nature; and was one of the first that was attempted. In these questions it is required to investigate curves in which quantities, depending on the whole extent of the required curve, taken between certain limits, are a maximum or minimum, relative to all other possible curves, as for example, the curve which encloses the greatest space according to some given conditions. There are many problems in mechanics of this nature. Newton first investigated the nature of the curve which, by revolving on its axis, produced the solid which opposed the least possible resistance to a fluid moving in the direction of its axis. Though some of these problems had been occasionally solved in particular instances, yet no general rule had been found applicable to them, till Lagrange devised the method known by the name of calculus variationum.

The first methods attempted towards the solution of these problems was, according to the differential notion, by dividing the curve into an infinite number of polygons, then determining the position of two adjacent sides, so that the quantity proposed becomes a maximum or minimum, by making the ordinate only vary according to the angle formed by the two sides. By this contrivance the problem is reduced to the former class, and the only difficulty is to bring the result to the differential form. It was thus found that the curve of the quickest descent was such, that the sine of the angle which one of its infinitely small sides makes, with the vertical, must always be proportional to the velocity, which is as the square root of the height from which the body has descended; and this proportion, reduced to a differential equation, gives the cycloid. This method was afterwards applied to problems still more complicated, particularly to those called *isoperimetrical*, in which it was required to find among all the curves having a given perimetre, that which within certain limits should contain the greatest or least surface; and from the difficulty of these problems, joined to the celebrity which they acquired by the labours of Euler and the Bernouillis, the general name of isoperimetrical was given to them, even in the case where the condition of equality in the length was not required.

In all the preceding investigations relative to maxima and minima, when z has been supposed a function of x, y; x and y have been supposed to have some constant relation to each other during the course of the problem, but in many problems, particularly in those under consideration, these relations are supposed continually to change. In a given curve for instance, x and y and $\mathrm{d}\, x$, and $\mathrm{d}\, y$ have a relation to each other defined by the nature of the curve, but in the method of variations, the ordinates y are no longer bounded by the original curve, but may pass into another, having no determinate relation with the former.

Let

Let V denote ſome function of x and y, and of the differential co-efficients of y, then the value of x remaining the ſame, the integral $\int . V . dx$ is ſuſceptible of an infinity of values, depending on the relation between x and y. It may therefore become a queſtion, among all the poſſible relations of x and y, to determine that, in which the integral $\int V dx$ (between certain limits) is a maximum or minimum; the integral $\int V dx$, when no particular relation between x and y is ſpecified, expreſſing the meaſure of a property belonging to all curves, it is required to determine the curve in which this property is a maximum or minimum. It is evident that if C E (*fig.* 8.) repreſent this curve, then in any other, $\gamma \epsilon$, the integral $\int V dx$ muſt be a value greater in the firſt caſe and leſs in the ſecond. To ſatisfy this condition, we muſt firſt inveſtigate the difference which any given change in the relation of x to y will make in the integral $\int V dx$; this change will be expreſſed by making y vary independently of x, for in conſidering the two curves C E, $\gamma \epsilon$, the ſame abſciſſa A P correſponds to two ordinates P M, P μ, and their difference, M μ, ſhould be diſtinguiſhed from the differences M R, $\mu \rho$, which take place between the conſecutive ordinates taken on the ſame curve.

In the calculus of variations as deviſed by La Grange, a differential equation, formed by conſidering the quantities as varying in one certain relation, is made the primitive of a new differential equation in which the quantities are ſuppoſed to vary in a new relation; and an hypotheſis is eſtabliſhed upon this ſecond operation ſuited to the nature of the ſubject under inveſtigation. It is by the ſymbol δ that this new operation is denoted; and taking for illuſtration the ſame curve lines as above, d denotes the variation or tranſition from one point to another on the ſame curve; δ that made in conſequence of a point moving into ſome new curve: thus M R being repreſented by dy, M μ will be δy; hence

$$P'M' = y + dy;\ P\mu = y + \delta y.$$

The point M′ paſſing to the point μ', we ſhall have

$$P'\mu' = y + dy + \delta(y + dy)$$
$$= y + dy + \delta y + \delta dy,$$

and by comparing theſe two expreſſions of the ſame line, this remarkable equation is obtained,

$$\delta dy = d\delta y.$$

The ſame reſult may be obtained without any reference to the nature of curve lines, by repreſenting by φx the primitive ſtate of y, and by ψx the conſequence of the ſuppoſed variation. Then $\delta y = \psi x - \varphi x$, will be a certain function of x, and likewiſe a function of y, becauſe of the primitive relation between x and y; let π denote this latter function, then $\delta y = \pi y$; let $y + dy = y'$; then $\delta y' = \pi y'$: hence $\delta y' - \delta y = \pi y' - \pi y = d\,\pi y = d\delta y$: but $dy = y' - y$, taking the variations

$$\delta dy = \pi y' - \pi y;\ \text{hence } \delta dy = d\delta y.$$

In like manner $\delta d^2 y = d^2 \delta y$, and generally $\delta d^n y = d^n \delta y$, by which it appears that the ſymbols d and δ may always be tranſpoſed.

The principle of La Grange's method conſiſts in taking the differentials of x, y, dx, dy, &c. according to the uſual proceſs, but relatively to another characteriſtic or ſymbol δ different from d, uſed in the firſt caſe; then tranſpoſing δ after d and $\int$, if it happen to precede them, and making δx, δy, &c. diſappear by integration from under the ſign $\int$.

Let the formula, which within certain limits is to be a maximum or minimum, be $\int z$, a function of x, y, dy, &c. Suppoſing dx conſtant, then $\delta . \int z$ will be the differential value in the caſe of a maximum or minimum; therefore $\delta . \int z = 0$, which may be transformed into $\int d z = 0$.

Let the differential of this equation, found in the uſual manner, but with the ſymbol δ, be

$$\delta z = M\delta y + N\delta dy + P\delta d^2 y + \&c.;$$

then $\int M\delta y + \int N\delta dy + \int P\delta d\,y + \&c. = 0.$

But $\int N\delta dy$ may be transformed into $\int N d\delta y$, and then by integration into

$$N\delta y - \int dN\delta y.$$

In the ſame manner $\int P\delta d\,y$ is transformed firſt into $\int P d^2 \delta y$; then into $P d\delta y - dP\delta y + \int d\,P\delta y$, and ſo of the others.

Adding the conſtant quantity k, or correction to theſe integrations, the equation becomes

$$N\delta y + P d\delta y - dP\delta y + \&c. + k$$
$$+ \int (M - dN + d^2 P - \&c.)\,\delta y = 0.$$

As all the differentials of δy have diſappeared from under the ſign $\int$, this part is not ſuſceptible of farther reduction. Therefore, to verify the equation independently of the variations, the co-efficient of δy under the ſign $\int$ muſt be made $= 0$, which gives the following equation,

$$M - dN + d\,P - \&c. = 0;$$

which equation muſt ſubſiſt for all the values of x and y contained within the given limits.

Example.—Let it be required to aſſign the relation between x and y when $\sqrt{dx^2 + dy^2}$ is a minimum, which is equivalent to finding the ſhorteſt diſtance between two points,

$$\delta\sqrt{dx^2 + dy^2} = \frac{dx\delta dx + dy\delta dy}{\sqrt{dx^2 + dy^2}},$$

(which, ſuppoſing $ds = \sqrt{dx^2 + dy^2}$)

$$= \frac{dx\,d\delta x}{ds} + \frac{dy\,d\delta y}{ds}$$

Here $\quad M = 0,\ N = \dfrac{dx}{ds},$

$$m = 0,\ n = \frac{dy}{ds},$$

$$M - dN = -d.\frac{dx}{ds} = 0,$$

$$m - dn = -d.\frac{dy}{ds} = 0.$$

Therefore $\dfrac{dx}{ds} = a$, a conſtant quantity,

$\dfrac{dy}{ds} = b$, a conſtant quantity.

or $x : y :: a : b$, an equation to a ſtraight line.

We ſhall conclude this article with Mr. Woodhouſe's method of applying theſe principles to the inveſtigation of the properties of motions, which we particularly wiſh to recommend to the notice of the mathematical reader.

Let the relation between the ſpace x, and time t, be denoted by $x = \varphi t$, then t being increaſed to $t + \Delta t$, $x + \Delta x = \varphi(t + \Delta t) = \varphi t + D\varphi t . \Delta t + D^2_c \varphi t . (\Delta t)^2 + \&c. = x + D . x . \Delta t + D^2_c . x . (\Delta t)^2 + \&c.$ and conſequently $\Delta x = D . x . \Delta t + D^2_c . x . (\Delta t)^2 + \&c.$ let moreover the relation between any other ſpace, y, and time t, be denoted by $y = ft$, then $\Delta y = f(t + \Delta t) - ft = Dft . \Delta t + D^2_c ft . (\Delta t)^2 + \&c. = D . y . \Delta t + D^2_c . y . (\Delta t)^2 + \&c.$ Now, if $x = y$, $D . x = D . y$, $D^2 . x = D^2 . y$, &c. $D^{n-1} . x = D^{n-1} . y$, then the motion of the body deſcribing the ſpace Δy, approaches more nearly to the motion of the body deſcribing the ſpace Δx, than

than can any other motion designated by an equation as $v = \psi\, t$, except $D \,.\, v = D \,.\, x$, $D^2 \,.\, v = D^2 \,.\, x \ldots$ &c. $D^{n-1} \,.\, v = D^{n-1} \,.\, x$; for, suppose it otherwise, then, since the motion to which corresponds $v = \psi\, t$, approaches more nearly to the motion to which corresponds $x = \varphi\, t$, than the motion to which corresponds $y = f\, t$, $\Delta x - \Delta v$ ought to be less than $\Delta x - \Delta y$, however small the time Δt be, or $(D \,.\, x - D \,.\, v)\, \Delta t + (D^2_c \,.\, x - D^2_c \,.\, v)\, (\Delta t)^2 +$ &c. (1) ought to be $< (D^n_c\, x - D^n_c \,.\, y)\, (\Delta t)^n + (D^{n+1}_c \,.\, x - D^{n+1}_c \,.\, y)\, (\Delta t)^{n+1} +$ &c. (2) however small the element Δt be taken, which is clearly impossible, except $D \,.\, x = D \,.\, v$, $D^2 \,.\, x = D^2 \,.\, v$, &c. and $D^{n-1} \,.\, x = D^{n-1} \,.\, v$, for if these differential co-efficients up to the n^{th} are not equal, the first term of series (1), must contain a power $\left((\Delta t)^{n-m} \right)$ of Δt less than $(\Delta t)^n$, and consequently, dividing by $(\Delta x)^{n-m}$, for $\Delta x - \Delta v$ to be less than $\Delta x - \Delta y$, $(D^{n-m}_c \,.\, x - D^{n-m}_c \,.\, v) + (D^{n-m+1}_c \,.\, x - D^{n-m+1}_c \,.\, v) \,.\, \Delta t +$ &c. must be $< (D^n_c \,.\, x - D^n_c \,.\, y) \,.\, (\Delta t)^m + (D^{n+1}_c \,.\, x - D^{n+1}_c \,.\, y) \,.\, (\Delta t)^{m+1} +$ &c. which, as has been shewn before, is impossible.

To apply this proposition to particular instances; let the equation between y and t be thus expressed, $y = a\, t$, a being a constant quantity, in which case the spaces are proportional to the times, and the motion is said to be uniform; then making $y = x = a\, t$, $\frac{d\,x}{d\,t}$ or $D \,.\, x = a$, consequently there is no other uniform motion which can approach so nearly to the motion, to which corresponds $x = \varphi\, t$, as that to which corresponds the equation $y = \frac{d\,x}{d\,t} \,.\, t$: for if possible, let $v = \alpha\, t$, then $v = x = \alpha\, t$, and $v = \frac{d\,x}{d\,t} \,.\, t$, the same equation as before.

The constant quantity a in the equation $y = a\, t$ is the measure of what is called the velocity, and consequently in the equation $x = \varphi\, t$ the co-efficient $\frac{d\,x}{d\,t}$ may be called the velocity of the body in motion, or, if the body moved uniformly with a velocity measured by the co-efficient $\frac{d\,x}{d\,t}$, it would have the property above specified, namely, that the space described by it, for a certain value of (Δt) and for all lesser values, will differ less from the entire space (Δx), than the space described in any other uniform motion, depending on a different element, or measure (α) of the velocity.

As a second example, let $y = b\, t^2$, b being constant, in which motion, the spaces described from rest, vary as the squares of the times, make $y = x = b\, t^2$, therefore $\frac{d\,x}{d\,t} = 2\, b\, t$, and $\frac{d^2\,x}{2 \,.\, d\,t^2} = b$, consequently, by what has preceded, the motion designated by the equation $y = \frac{d^2\,x}{2 \,.\, d\,t^2} \,.\, t^2$ is (at the point where $y = x$, and $\frac{d\,y}{d\,t} = \frac{d\,x}{d\,t}$) more nearly equal the given motion $(x = \varphi\, t)$ than any other motion designated by a similar equation to the equation $y = b\, t^2$; for assuming $v = \beta\, t^2$ it appears, that $\beta = \frac{d^2\,x}{2 \,.\, d\,t^2}$, whence $v = \frac{d^2\,x}{2 \,.\, d\,t^2} \,.\, t^2$, the same equation as has been deduced.

In the equation $y = b\, t^2$, in which the motion of the body is accelerated, the element b is the measure of what is called the accelerating force; and agreeably to such imposition of terms, the accelerating force belonging to a motion $x = \varphi\, t$, is equal $\frac{d^2\,x}{2 \,.\, d\,t^2}$ or has the property above specified; and moreover, when the accelerating force is required to be calculated, it is simply the co-efficient $\frac{d^2\,x}{2 \,.\, d\,t^2}$ that is to be estimated: the term itself has been introduced from the disposition men have to speak of the causes of effects, although it is clear, that by imposing a mere term on an effect, nothing is taught concerning the cause of that effect; when the term occurs, nothing more is to be understood by it, than the specification of an effect, that is, the uniform acceleration of the body's motion, or what amounts to the same, the continual and uniform augmentation of the velocities, the measure of velocity being a space described in a given time.

Hence, in the form $\Delta x = \frac{d\,x}{d\,t} \,.\, \Delta t + \frac{d_2\,x}{d\,t^2} \,.\, (\Delta t)^2 + \frac{d_3\,x}{d\,t^3} \,.\, (\Delta t)^3 +$ &c. the whole space (Δx) may be conceived composed of a number of spaces due to particular kinds of motion; the first term $\frac{d\,x}{d\,t} \,.\, \Delta t$ is the space described in uniform motion with a velocity $= \frac{d\,x}{d\,t}$, the second $\frac{d_2\,x}{d\,t^2} \,.\, (\Delta t)^2$ is the space described in motion uniformly accelerated, the quantity of the acceleration depending on the co-efficient $\frac{d_2\,x}{d\,t}$, the third term $\frac{d_3\,x}{d\,t} \,.\, (\Delta t)^3$ is another space due to a motion, the kind of which has not been described in terms as the two former have, because no such motion occurs in nature: its laws, however, are defined with the same precision as the laws of uniform, and uniformly accelerated motion: a like observation is to be extended to the other spaces $\frac{d_4\,x}{d\,t} \,.\, (\Delta t)^4$, $\frac{d_5\,x}{d\,t^5} \,.\, (\Delta t)^5$, &c.

Since the velocity $(V) = \frac{d\,x}{d\,t}$ and accelerating force $(F) = \frac{d^2\,x}{2 \,.\, d\,t^2}$, $F = \frac{1}{2 \,.\, d\,t}\, d \left(\frac{d\,x}{d\,t} \right) = \frac{1}{2 \,.\, d\,t} \,.\, d\,V$, or $2\,F \,.\, d\,t = d\,V$, and $2\,F \,.\, d\,t \,.\, \frac{d\,x}{d\,t} = V\, d\,V$, whence, if F be given a function of the time (t) the integral of $V\, d\,V$, to wit, $\frac{V^2}{2}$ may be exhibited by a function likewise of the time; and by making t a function of x, $\frac{d\,x}{d\,t} = \frac{1}{\frac{d\,t}{d\,x}}$, $\left(\frac{d\,x}{d\,t}, \frac{d\,t}{d\,x} \right.$, representing the differential co-efficients of x a function of t, and of t a function of x) the expression becomes $\frac{1}{2\,F \,.\, d\,x}$

$2F.dx = VdV$, whence F being given a function of the pace V^2 may be deduced a function.

Since $\Delta x = \frac{dx}{dt} . \Delta t + \frac{d^2 x}{1.2.dt^2} . (\Delta t)^2 + \&c.$ if the body fall from reft, or the velocity $\frac{dx}{dt} = 0$, then $\Delta x = \frac{d^2 x}{1.2.dt^2} . (\Delta t)^2 + \frac{d^3 x}{1.2.3.dt^3} . (\Delta t)^3 + \&c.$ now fince Δt may be taken fuch, that $\frac{d^3 x}{1.2.3.dt^3}$ fhall be greater than the fum of all fucceeding terms, fo that $\left(\frac{d^2 x}{1.2.dt^2} + \frac{d^3 x}{1.2.3.dt^3} . \Delta t + \&c.\right) \angle \left(\frac{d^2 x}{1.2.dt^2} + \frac{2.d^3 x}{1.2.3.dt^3} . \Delta t\right)$ and à fortiori, lefs, for all leffer values of Δt, it is clear, that by taking Δt of a proper fmallnefs, $\left(\frac{d^2 x}{1.2.dt^2} + \frac{2.d^3 x}{1.2.3.dt^3} . \Delta t\right) (\Delta t)^2$ may be made to differ from $\frac{d^2 x}{1.2.dt^2} . (\Delta t)^2$ by a difference lefs than any affignable quantity.

This is all that is to be underftood in the prefent method, concerning an equality that is faid to fubfift between the fpaces defcribed in initio motus, the fquares of the times, and other conftant quantities.

As, in the cafe of tangents and radii of curvature, the analytical properties were firft ftated and the geometrical deduced, fo, in the cafe of velocities and accelerating forces, the analytical properties being firft ftated, the mechanical properties (if they may be fo called) have been deduced; and a reverfe procefs, it is evident, may be inftituted; thus, defining the meafure of the velocity of a body in variable motion, at a given point, to be a quantity, fuch, that if the body moved uniformly, (the kind of uniform motion being determined by that conftant quantity) the fpace defcribed would be nearer the entire fpace (Δx), than any other fpace defcribed by another uniform motion, the velocity may be deduced; thus, let a be its meafure, then the fpace defcribed in the time $\Delta t = a . \Delta t$, and Δx being $= \frac{dx}{dt} . \Delta t + \frac{d^2 x}{1.2.dt^2} (\Delta t)^2 + \&c.$

$\left(\frac{dx}{dt} - a\right) \Delta t + \frac{d^2 x}{1.2.dt^2} . (\Delta t)^2 + \&c.$ is $<$ $\left(\frac{dx}{dt} - \alpha\right) \Delta t + \frac{d^2 x}{1.2.dt^2} . (\Delta t)^2 + \&c.$ which cannot be generally afferted; for, make the conftant quantity $\alpha = \frac{dx}{dt}$, then Δt may be taken fo fmall, that $\frac{d^2 x}{1.2.dt^2} . (\Delta t)^2 + \&c.$ fhall be $< \left(\frac{dx}{dt} - \alpha\right) \Delta t + \frac{d^2 x}{1.2.dt^2} . (\Delta t)^2 + \&c.$ but if $\frac{dx}{dt} = a$, then can $\left(\frac{dx}{dt} - a\right) . \Delta t + \&c.$ be $< \left(\frac{dx}{dt} - \alpha\right) \Delta t + \frac{d^2 x}{1.2.dt^2} . (\Delta t)^2 + \&c.$ whilft $\frac{dx}{dt}$ does not equal α, and confequently, the element a put for the velocity, muft $= \frac{dx}{dt}$.

In like manner taking the definition that has been given of the accelerating force, its value may be fhewn equal $\frac{d^2 x}{1.2.dt^2}$.

The term velocity has caufed much confufion of ideas; its meafure is the conftant quantity expreffing the ratio between the fpace and time in uniform motion; in the equation $x = at$, it is a, which element ferves to diftinguifh one uniform motion from another; in variable motion, the meafure of the velocity is $\frac{dx}{dt}$; and this only is meant, that a body moving uniformly with this velocity $\frac{dx}{dt}$, would defcribe a fpace $\frac{dx}{dt} . \Delta t$, which has the conditions above fpecified: a like explanation is to be given of the term *accelerating force* in variable motion; when the accelerating force is faid to vary as a function (fx) of the fpace defcribed, what is to be underftood, is, that the co-efficient $\frac{d^2 x}{dt^2}$ varies as fx.

The fpace $\Delta x = \frac{dx}{dt} . \Delta t + \frac{d^2 x}{1.2.dt^2} (\Delta t)^2 + \&c.$ and confequently, $\frac{\Delta x}{\Delta t} = \frac{dx}{dt} + \frac{d^2 x}{1.2.dt^2} . \Delta t + \&c.$ now by what has appeared, $\frac{dx}{dt}$ may be made to differ from $\frac{\Delta x}{\Delta t}$ by a quantity lefs than any affignable quantity; and this is all that is clearly intelligible concerning any *equality* that can fubfift between $\frac{dx}{dt}$ and a certain ftate of $\frac{\Delta x}{\Delta t}$; in the language of limits, the limit of $\frac{\Delta x}{\Delta t}$ or $L.\frac{\Delta x}{\Delta t}$ is faid to equal $\frac{dx}{dt}$.

The definition of velocity being given, to determine its quantity, or meafure in variable motion, becomes a matter of computation: and x being a function of the time, the differential co-efficient $\frac{dx}{dt}$, the meafure of the velocity muft be computed, which, by preceding methods, can always be effected; but the differential co-efficient, or what correfponds to it, may be eftimated by feveral methods, although the principle on which they are founded is in fact the fame; hence computing by fuch methods the velocity, the quantity deduced muft be what, really, $\frac{dx}{dt}$ is; not fimply the firft differential co-efficient of $x + \Delta x$ expanded, but the firft differential co-efficient obtained by a particular hypothefis; now the method the fluxionifts have followed is this; they define fluxions to be velocities, and having, by certain proceffes, obtained the quantity fymbolical of the velocity, they, in fact, had obtained the fluxion or differential of a quantity: a procedure, it fhould feem, not very philofophical; fince velocity, as a term by which fluxions are

defined,

defined, itself in variable motion, wants definition, and, as a principal, wants computation. And when, as has been already ſtated, a partial theory, itſelf to be included under the general theory of quantity, was employed to illuſtrate that theory, correſponding modes of conceiving quantity, and expreſſions to reaſon about quantity, became neceſſary: every thing that could become the ſubject of inveſtigation was to be conceived as generated by motion, or its increaſe to be analogous to the deſcription of right lined ſpace by a moving body; figurative expreſſions entered as parts of this theory, and the ſevere ſciences were diſcuſſed iu terms and phraſes new to geometry.

Science, however, derived an incalculable advantage from the invention of the method of fluxions, but the excellence of this invention, one of the foundation ſtones of the immenſe fabric of Newton's fame, does not conſiſt in the principle by which quantity was conceived to be generated by motion, but in the proceſſes and rules by which it was taught, how the properties of motion might be inveſtigated, and conſequently, the ſimilar properties of continued quantity; in the ſimple excogitation of the principle of motion, Newton had been preceded by Roberval.

According to the view that has been taken of the differential calculus, it is to be conſidered as a branch of common algebra, or rather as a part of the common ſymbolical language in which quantity is treated of. In its mere proceſſes and rules it demands no hypotheſis, it requires the eſtabliſhment of no theory; the differential of $f\,x$ is ſimply the ſecond term of $f\,(x + \mathrm{d}\,x)$ expanded, $\mathrm{d}\,x$ being altogether arbitrary; and in particular caſes, as x^m, a^x, $\mathrm{L}\,.\,x$, &c. comprehended by $f\,x$, $m\,x^{m-1}\,\mathrm{d}\,x$, $\mathrm{A}\,a^x\,\mathrm{d}\,x$, $\frac{\mathrm{d}\,x}{\mathrm{A}\,x}$, &c. In its application, the calculus cannot be ſaid to demand any new hypotheſis, but ſimply requires this propoſition to be eſtabliſhed, *viz.* that in a ſeries $a + a'\,.\,x + a''\,.\,x^2 +$ &c. x may be taken of ſuch a magnitude, that any term, as $a^{'\cdots n}\,x^n$, ſhall be greater than ſum of all the ſucceeding terms. In the method of fluxions and of limits, the differential (or fluxion) of a function $f\,x$, although expreſſed by the ſecond term of $f\,(x + \mathrm{d}\,x)$, or $f\,(x + \dot{x})$ expanded, is not ſimply that ſecond term, but is expreſſed by it, under the circumſtances of a particular hypotheſis and of a particular theory; and conſequently, the mere analytical proceſſes and operations by which rules are founded become burthened with that theory.

Function, in *Phyſiology*, the office in the animal economy performed by any part of the body. In this ſenſe it is ſynonymous with the *uſe* of the part; we ſpeak of the function of the kidney, teſtis, &c. The term, however, is employed, more extenſively, to denote the great proceſſes of the living body, the performance of which requires the co-operation of many organs; as thoſe of digeſtion, ſenſation, &c. Theſe ſubjects will all be conſidered under their reſpective articles in the Cyclopædia. We have given here a view of the different functions, arranged in the form of a table, ſo as to exhibit their mutual relations, and to afford alſo a general claſſification of the ſubjects belonging to phyſiology. This table is taken from the elements of phyſiology of Richeraud. We do not attach any great importance to the peculiar mode of the arrangement: all ſuch diviſions muſt be in great meaſure arbitrary. The various parts of the living ſyſtem are connected together; the functions are mutually dependent, ariſe out of each other, and are executed ſimultaneouſly. They repreſent altogether a circle, in which we cannot aſſign a beginning or an end. Digeſtion, abſorption, circulation, the ſecretions, nutrition, ſenſation, motion, the voice, and even generation, may be all going on at once; but an obſerver would find himſelf much confuſed by attending at the ſame time to all this aſſemblage of proceſſes. Again, when he proceeds to the work of abſtraction, when he begins to contemplate ſome ſingle part of the vital phenomenon, he muſt not look upon this as inſulated or independent, but advert to its connection with other parts of the economy. A more detailed view of theſe matters will be exhibited in the article Life.

The older writers divide the functions into four claſſes, called the animal, vital, natural, and generative. The firſt of theſe includes the ſenſations and motions, which form the diſtinguiſhing characters of animals; the ſecond, the proceſſes of circulation and reſpiration, the continuance of which is neceſſary to life; the third, digeſtion, chylification, abſorption, urinary ſecretion, &c. by which the nouriſhment and growth of the body are performed; and the fourth, thoſe proceſſes by which the continuance of the ſpecies is provided for. Such an arrangement is very arbitrary, and open to numerous objections. The vital and animal functions are ſometimes claſſed together under the former name. Vicq d'Azyr has prefixed an arrangement of functions to his great work, the "Traité d'Anatomie avec des plauches coloriées." This is objectionable, ſince ſenſibility, irritability, and oſſification, are there included. Now the two former are the powers or properties by which certain parts are enabled to perform their functions, and the latter is merely a mode of nutrition peculiar to a certain ſtructure of the body.

Tabular

TABULAR View of the Functions of the Animal Economy.

- First Class. FUNCTIONS CONCERNED IN THE PRESERVATION OF THE INDIVIDUAL. (*Life of the individual.*)
  - First Order. By assimilating food to his own substance. (*Interior, assimulative, or nutritive functions.*)
    - First Genus.—DIGESTION. Extracts from it the nutritive parts.
      - Prehension of the food,
      - Mastication
        - First dentition,
        - Second ditto,
      - Insalivation,
      - Deglutition,
      - Digestion in the stomach,
      - ——— duodenum,
      - ——— small intestine,
      - Excretion of fœces,
      - ——— urine.
    - Second Genus.—ABSORPTION. Conveys the nutritive matter into the blood.
      - Absorption of chyle,
      - ——— lymph,
      - Action of the absorbing vessels,
      - ——— glands,
      - ——— thoracic duct.
    - Third Genus.—CIRCULATION. Carries it to all the organs.
      - Action of the heart,
      - ——— arteries,
      - ——— capillary vessels,
      - ——— veins.
    - Fourth Genus.—RESPIRATION. Exposes it to the atmosphere.
      - Action of the parietes of the chest,
      - ——— lungs,
      - Changes produced in the air,
      - ——— blood,
      - Production of animal heat.
    - Fifth Genus.—SECRETIONS. Make it undergo various modifications.
      - Formation of serum,
      - Follicular or mucous secretion,
      - Glandular secretion.
    - Sixth Genus.—NUTRITION. Applies to the organs, for the purposes of growth and nourishment.
      - Different in each part, according to its peculiar composition.
  - Second Order. By establishing his relations to surrounding objects. (*Exterior or relative functions.*)
    - First Genus.—The SENSATIONS. Give him notice of their presence.
      - Organs
        - of sight,
        - — hearing,
        - — smelling,
        - — tasting,
        - — touching,
      - Action of the nerves,
      - ——— brain,
      - Faculties of the mind,
      - Perception,
      - Memory,
      - Judgment,
      - Volition,
      - Sleeping and waking,
      - Dreams and somnambulism.
    - Second Genus.—The MOTIONS. Bring him towards, or remove him from them.
      - Muscles,
      - Muscular action,
      - The skeleton,
      - Articulations,
      - Erect position, or
      - Standing at rest,
      - Progressive motions
        - Walking,
        - Running,
        - Leaping,
        - Swimming,
        - Flying,
        - Creeping.
      - Motions of the upper limbs,
      - Attitude, Gesture.
    - Third Genus.—VOICE and SPEECH. Enable him to communicate with is fellows without moving.
      - Voice,
        - Articulated, or speech,
        - Modulated, or singing,
      - Lisping,
      - Stammering,
      - Dumbness,
      - Ventriloquism.

Second

- Second Class. FUNCTIONS CONCERNED IN THE PRESERVATION OF THE SPECIES. (*Life of the species.*)
  - First Order. Requiring the concourse of both sexes. — CONCEPTION and GENERATION.
    - Sexual distinctions,
    - Hermaphrodites,
    - Systems concerning generation.
  - Second Order. Performed by the female.
    - GESTATION.
      - Pregnant uterus,
      - History of the embryo,
      - ——— fœtus,
      - ——— its coverings.
    - PARTURITION.
      - Uterus after parturition,
      - Discharge of the lochia.
    - LACTATION.
      - Office of the mammæ,
      - Milk.
- AGE OF GROWTH.
  - Infancy
    - Dentition,
    - Ossification.
  - Puberty — Menstruation.
  - Adolescence.
- AGE OF MANHOOD.
  - Differences of temperament,
  - Idiosyncrasies,
  - Different races of mankind.
- AGE OF DECAY.
  - Period of decline,
  - Old age,
  - Decrepitude.
- DEATH.
- PUTREFACTION.

FUND, FUNDUS, a Latin term, used for the bottom of certain things; and particularly of certain parts of the body.

FUND *of the eye, Fundus oculi*, is that part possessed by the choroides and retina.

The images of objects are represented in an inverted situation, in the fund of the eye. See VISION.

FUNDUS *Uteri*, or *bottom of the womb*, is the body or principal part thereof; so called in contradiction to the cervix, or neck; the osculum, or mouth; and the vagina, or sheath.

FUNDUS *Vesicæ*, or *bottom of the bladder*, is the cavity thereof, wherein the urine is contained. In men it is placed over the rectum; and in women over the matrix.

FUND *of the Gall-bladder*, the *Stomach*, &c. See GALL-*bladder*, STOMACH, &c.

FUNDUS *Plantæ*, is that part of a plant where the stalk just meets and joins the root.

FUNDUS *Cœli*, is the point opposite to the point of culmination; or the point of the ecliptic, wherein it is intersected by the meridian beneath the horizon.

FUND, in *Commerce*, is used for the capital or stock of a merchant, company, or corporation; or the sum of money they put into trade.

In this sense we say absolutely, the funds, the public funds, meaning the stock of the great companies, or corporations, as the Bank, South-sea, East-India, &c.

FUNDS, *Public*, are the taxes appropriated by parliament to the support of civil government, and the payment of the principal and interest of money borrowed for public services. These funds, in Britain, have been all formed into the four following classes or divisions: the *Aggregate Fund*, the *South-sea Fund*, the *General Fund*, and the *Sinking Fund*. Of all these, but more especially the last, we shall give an account in the order in which they have been now named.

The aggregate fund was established by an act of Geo. I. cap. 12. in 1715. It had this name given it, because it consisted of a great variety of taxes and surplusses of taxes and duties which were in that year consolidated, and given as a security for the discharge of the interest and principal of debts due to the Bank of England, and some other public debts; and also for the payment of 120,000*l.* per ann. to the civil list. Into this fund were brought the two-thirds and one-half subsidy of tonnage and poundage; half the inland duties on tea and coffee; the house-money granted by the 7th of Will. III.; the duty on hops; the duties on low wines, brandy, and British spirits; all arrears of land-taxes; all public monies not appropriated; the surplusses of the nine-penny excise, of the five-sevenths of the Bank nine-penny excise, of the revenues in the annuity acts of the 4th, 5th, and 6th of queen Anne, &c. and by an act of the 1st of Geo. III. all the duties constituting the revenue of the civil list.

The South-sea fund was established by stat. 3 Geo. I. cap. 9. in 1716; and was so called, because appropriated to pay the interest of the South-sea company's capital. It consisted of a duty on candles, and certain imposts on wines, vinegar, tobacco, and East-India goods.

The general fund was also established by stat. 3 Geo. I. cap. 7. in 1716, and consisted of a subsidy on goods exported; a tax on hackney-coaches and chairs; duties on soap, hides, stamps, and policies of insurance; 700*l.* per week letter-money; a moiety of the inland duties on tea and coffee; and 39,855*l.* per annum out of the hereditary excise on beer for the bankers annuities. All these taxes were appropriated to the discharge of the interest of 7,808,087*l.* (originally 10,000,000*l.*) capital stock of South-sea annuities, together with charges of management.

All that remained of the produce of the taxes thus digested into these three funds, after satisfying the charges upon them, was in the same year (or 1716) carried into a fourth fund, to which was given the name of the sinking fund, because appropriated to the *sinking* of the public debts. The words of the act of the 3d of Geo. I. which established this fund, are, "All the monies to arise from time to time, as well of the excess and surplus of an act made this session for redeeming the funds of the Bank of England; and of the excess or surplus by virtue of one other act made likewise this session for redeeming the funds of the South-sea company; as also of the excess or surplus of the duties and revenues by this act appropriated as aforesaid; and the overplus monies of the said general fund by this act established; shall be appropriated to the discharging the principal and interest of such national debts as were incurred before the 25th of December, 1716, and are declared to be national debts;

debts; and to or for no other ufe, intent, or purpofe whatfoever."

The tranfactions, with refpect to this finking fund, form fo important a part of the hiftory of Britain, that it may not be improper here to give a more particular account of it.

Before its eftablifhment there had exifted many fmaller funds of the fame nature: that is, fuch duties or taxes had been provided for paying the interefts of particular loans, as afforded furpluffes by which the principal itfelf was to be gradually redeemed. This was the common practice in the reigns of king William and queen Anne. Moft of the public duties were given for terms of years; and at the end of thofe terms they ceafed of courfe, unlefs continued for farther terms by new acts of parliament: and, in general, it was provided, when any money was raifed, that the principal fhould be cancelled either by time, as in the cafe of the fale of long and fhort annuities, or by the furpluffes of the duties charged with the payment of the intereft. This was an excellent plan; but it was by no means carried fteadily into execution. In the year 1720, moft of the long and fhort annuities were converted into redeemable perpetuities, at the expence of above three millions; and the furpluffes of the duties charged with particular loans were often fo broken into, by being either charged with new loans before they had cancelled the old, or fpent on current fervices, as to be rendered incapable of anfwering the end intended by them. In confequence partly of this bad management, the public debts at the acceffion of the houfe of Hanover were fo much increafed as to be generally reckoned infupportable: and their reduction was made one of the firft objects of parliamentary attention. This gave rife, in 1716, to the inftitution of the fund of which we are giving an account, the father of which was (as has been generally faid) fir Robert Walpole, but, in reality, the earl Stanhope. All the taxes, except the land-tax, and fix-pence per bufhel malt-tax, were now made perpetual, and diftributed into the three funds which have been defcribed; the furpluffes of which, for ever afterwards, were to be held facred, and to be applied inviolably, according to the words of the act juft recited, to the redemption of the national debt.

A confiderate perfon might have fufpected, that the fame caufes which had rendered former partial appropriations ineffectual, would deftroy the efficacy of this. There feemed, however, to be reafon for hoping the contrary: for,

Firft, the future happinefs and glory of the kingdom were thought to depend on this appropriation; and the law which eftablifhed it was declared to be a fundamental law of the realm. Secondly, in conformity to thefe fentiments, the words of this law were made as ftrong as poffible; and, in order to give additional force to it, a repetition of it in the fame words, was inferted in an act of the 5th of Geo. I. cap. 3. Particular notice fhould be taken of thefe words: they order that all the furpluffes of the taxes then made perpetual fhall be applied to the difcharge of the public debts, and "to no other ufe or intent whatever." When, therefore, a debt had been paid off, the addition arifing from that payment to the furpluffes (or the annuity difengaged by it) became a part of the fund, and, together with it, was to be employed in difcharging farther debts. And the fame being true of every fucceffive annuity difengaged by every payment, the fund, if never mifapplied, muft neceffarily have operated in finking the public debt, in the fame manner that money accumulates, when put out to bear compound intereft. And in this way this fund did in fact operate for a few years. While in its infancy, it was watched over with great care. The improvement, and the inviolable application of it, were recommended in moft of the fpeeches from the throne, and echoed back in the addreffes of the houfe of commons. It is particularly obfervable, that fo well did our minifters then underftand the nature and importance of this fund, that rather than encroach upon it, they frequently borrowed money, in order to defray the neceffary expences of government. From fome publications in 1726 it appears, that fome perfons had been led to apprehend this zeal of the miniftry would not be permanent, becaufe it was not their intereft to pay off the public debt, on account of the dependence and influence created by it. In anfwering this objection, the writers on the fide of the court called fuch an apprehenfion an *indecent jealoufy*, and took upon them to affure the public, "that in no poffible exigence of affairs could our minifters ever approve of or recommend the alienation of the finking fund." Happy would it have been for Britain had this proved true: but in a little time it appeared, that the apprehenfions which had been ftiled *indecent jealoufies* were too well grounded. Men in power came foon to fee, that this fund was advancing too faft in its operations, and to change their zeal for it into a refolution to deftroy it. This will abundantly appear from the following facts.

Charging the income of the finking fund with the payment of the intereft of new loans, is an encroachment upon it, no lefs fubverfive of its efficacy, than depriving it of grofs fums; there being no difference between taking from it the annual intereft of a fum, and that fum itfelf. Between the years 1727 and 1732 feveral encroachments of this kind had been made upon it; but, being of a lefs obvious nature, they paffed without meeting with any particular oppofition. The finifhing blow was given in the year 1733. In that year, in order to keep the land-tax at one fhilling in the pound, it was neceffary either to borrow half a million for the current fervice, or to take this fum from the finking fund. The laft method was chofen, and propofed by fir Robert Walpole to the houfe of commons. Long and warm debates enfued. A propofal to alienate, in a time of profound peace, a fund which the law had made facred, and the alienation of which no poffible exigence of public affairs could juftify, only for the fake of keeping the land-tax for one year at one fhilling in the pound, juftly kindled the indignation of the patriotic party. They urged the prohibition of the law, the faith of parliament, and the fecurity of the kingdom. The propofer of the alienation was reminded of his inconfiftency and treachery, in endeavouring to beat down that very monument of glory which he had boafted of having erected for himfelf; and fir John Barnard warned him, that he was drawing upon himfelf the curfes of pofterity. But all arguments were vain. The miniftry pleaded that the landed intereft wanted eafe; that there was no occafion for being in a hurry to pay the national debt; and that the circumftances of the kingdom had altered fo much fince the eftablifhment of the finking fund, that the competition then among the public creditors was, not who fhould be firft, but who fhould be laft paid. Thus argued, among others, fir Robert Walpole. His reafons prevailed; and the houfe of commons, not ufed to refufe him any thing, confented.

The practice of alienating the finking fund having been thus begun, went on of courfe. In the next year, or 1734, 1,200,000*l.* was taken from it. In 1735, and 1736, it was anticipated and mortgaged.

In 1737 and 1738, a million of the ftock of Bank annuities, and two millions of the ftock of South-fea annuities, were redeemed with it. For twelve years after 1738, it was wholly applied to the current expences of every year. In 1749, the intereft of near fifty-eight millions of the public

public debts was reduced from four to three one-half per cent. intereft for feven years, and afterwards to three per cent. for ever; and by this third reduction an addition was made to the finking fund of near 600,000*l.* per ann. But notwithftanding the great addition which this *third* reduction of intereft made to the finking fund, no more than three millions of the public debts were redeemed by it, during the interval of peace between the years 1748 and 1756.

By an act of the 25th of Geo. II. 1752, a change was made in the finking fund, which it is neceffary to mention.

Before this act the finking fund confifted only of the clear furpluffes of the aggregate, the general, and the South-fea company's funds. By the war, which begun in 1740, there was an addition made to the public debts of near thirty-two millions. This occafioned a great increafe of taxes; and the practice was, whenever any new tax produced lefs than the intereft with which it was charged, to make good the deficiency out of the finking fund, and afterwards to replace the fum taken from it out of the fupplies for the following year. But whenever a tax produced more than the charge upon it, the overplus, inftead of being carried to the finking fund, was made a part of the fupplies for the year. By the act juft mentioned, all the new taxes, together with all the annuities to the payment of which they had been appropriated, were ordered to be carried into the finking fund, and formed into one general account. Moft of the new taxes having proved deficient, this fund at firft loft more than it gained by the change. But the lofs was afterwards more than made up; firft, by the faving which was produced by the reduction of intereft from three one half per cent., to three per cent. in 1757; and, fecondly, by the addition, in the fame year, of the falt-duties to this fund, after they had completed the redemption of a million with which they had been charged in 1745.

The war which began in 1756 added feventy-one millions and a half to the public debts. This produced a new increafe of taxes, which (in conformity to the confolidating act juft mentioned) were brought to the general finking fund account, together with the annuities or interefts with the payment of which they were charged. And previous to the American war it became the conftant practice, whenever a new fund or tax was created for paying the intereft of a loan, to carry both into the finking fund; in confequence of which this fund gained when the tax happened to produce more, but loft when it produced lefs than the intereft which it had been given to pay. The finking fund, therefore, which, before the confolidating act, confifted only of the furpluffes of the aggregate, general, and South-fea company's funds, confifted afterwards of the clear furplus of all the appropriated taxes. There was only one exception, namely, the additional tax upon houfes and windows, granted in 1758 towards paying the intereft of four millions and a half then borrowed. This tax was never made a part of the finking fund; and, having always proved deficient to the amount of about 43,000*l.* per ann. the deficiency was conftantly made good by the finking fund, and afterwards replaced from the fupplies.

Before the laft reduction of the intereft of the public debts, the finking fund, having fuffered greatly from various encroachments upon it, produced little more than a million per ann. But after this reduction, and its increafe by the addition of the falt-duties, it produced near two millions per ann. In 1764 it produced at Michaelmas, after making good deficiencies, 2,105,000*l.* nearly. For five years after 1764, its average pro duce, reckoned to Chriftmas in every year, was 2,234,780*l.* For five years, ended in 1774, its average produce (after making good the deficiency in 1758) was 2,610,759*l.* In 1775 it produced 2,917,869*l.* In 1776, 3,166,517*l.* In 1777 it was charged with an annuity of 100,000*l.* per ann. to the civil lift; and, after paying three quarters of this annuity, and half a year's intereft of five millions borrowed in that year, it produced from Oct. 1776 to Oct. 1777, 2,685,669*l.* From Oct. 1777 to October 1778, 1779, and 1780, it produced 2,442,063*l.*—2,267,399*l.*—and 2,403,017*l.* after paying the faid annuity, and alfo after making good the deficiency of the fund in 1758, and all the deficiencies of the new taxes.

It appears from this detail, that after the peace in 1763 the income of the finking fund increafed confiderably. The caufes of this were partly the falling in of life-annuities, and the greater productivenefs of the taxes occafioned by the increafe of luxury. But the principal caufe was the falling in of the intereft of about ten millions and a half of the public debts, which had been difcharged during the twelve years of peace between 1763 and 1775. This diminution of the public debts was made, not by the finking fund, but by a contribution from the Eaft-India company of 400,000*l.* per ann. begun in 1768, and continued for five years; by the profits of ten lotteries; by the compofition for maintaining French prifoners; fale of French prizes taken before the declaration of war in 1756; and other extraordinary receipts, amounting in all to above eight millions. This fund, therefore, did not pay off more than two millions and a half, the reft of its produce having been employed in bearing the expences of the peace eftablifhment, which, during that period, were nearly double to what they had been in any former period.

To the fum juft mentioned, add three millions paid off in the peace between 1748 and 1756, and three millions paid off in 1736 and 1737, and it will appear that the whole amount of the public debts paid off by the finking fund, fince its firft alienation in 1733, to the commencement of the American war, was only eight millions and a half. Had no fuch alienation ever taken place; had even *half* its annual produce been invariably applied to the purpofe for which it was originally formed, the whole debt would have been redeemed, and the nation at that period would confequently have been relieved from the whole burden of its taxes; and it is poffible alfo that the whole expence of that calamitous war, and the lofs of the Britifh colonies, would have been prevented. But the preffure of thefe burdens having continued with equal force, during the whole interval of a peace of eleven years without the moft diftant profpect of being diminifhed by any prudence or economy in the management of public affairs, the nation fuffered itfelf to be plunged into a war with the hope of being relieved from a part of its burdens, by compelling the colonifts to bear a fhare in the fupport of them. Unfortunately, however, this war, like all that preceded it, inftead of diminifhing, increafed the public burdens, fo that the debt, which at its commencement amounted to 136 millions, had accumulated at its termination in 1783 to more than 268 millions. At this period the feveral changes in the miniftry prevented any improvement from being made in the management of the public finances. The immediate fucceffors of lord North, if they had been fo difpofed, had fcarcely time to form any plan for the purpofe; and the meafures which had been recommended in the king's fpeech, during the fhort adminiftration of the earl of Shelburne, were totally difregarded by the party that followed him into power; fo that it may be truly faid, that until the end of that adminiftration the management of the finances was conducted

with the same disregard to economy and the public interest, as had uniformly distinguished it from the first days of sir Robert Walpole. In the year 1784, however, when Mr. Pitt, after having been forced to resign with lord Shelburne in the preceding year, was raised to the chief administration of public affairs, the ruinous plans which had hitherto been pursued were discontinued, and very considerable improvements were made both in the mode of conducting the loans which were necessary for discharging the arrears of the late war, and in the general arrangement of the public accounts. Instead of borrowing at a low interest, and thus adding a needless capital to the public debt, the measure so often recommended by Dr. Price, of borrowing at a high interest, with the view of facilitating the redemption of the debt, was adopted, and the public accounts were thrown into new order, by abolishing the former division of the taxes under the four heads of *Aggregate, South-sea, General*, and *Sinking funds*, and including the whole in one fund called the *Consolidated fund*. The surplus remaining, after deducting from the taxes thus consolidated, all the expences of the public debts and the civil list, corresponded with what was formerly called the *Sinking fund*. This surplus, which Mr. Pitt estimated at a million annually, though it never fairly produced half that sum during the whole time that intervened between the establishment of the fund and the commencement of the French war, was appointed by parliament to be applied to the gradual discharge of the public debt. For this important measure the minister was wholly indebted not only to the writings but to the immediate advice and assistance of Dr. Price. But in claiming the honour of having his name inscribed on a pillar to public credit for having adopted it, Mr. Pitt thought proper to assume the whole merit of the measure to himself, without the slightest notice of the source from which he had derived his information, and thus exhibited a much less equivocal proof of his ambition than either of his magnanimity or gratitude.

Of the three plans which Dr. Price communicated at his request, Mr. Pitt chose the most feeble, from the fear of adding to the taxes 600,000*l.* a year, which would have been required to assist the operations of the other plans. Happy had it been for the nation if he had always entertained the same apprehensions, however much it may be regretted that he should have been influenced by them on this occasion.

In the first plan, it was proposed by Dr. Price, in addition to the million surplus, to aid the operations of the fund by the falling in of the temporary and life annuities, by converting 60 millions of three per cents into four per cents, and providing in the first five years 600,000*l.* per annum, for paying the difference of interest. In the course of 30 years this would have redeemed 114,491,991*l.* of stock in the three, four, and five per cents, and given a free revenue of 6,345,566*l.* In the second plan, all the same aids were proposed, except that the conversion of the three per cents into four per cents was omitted. This would have retarded the operations of the fund in a small degree, as the stock redeemed in the three, four, and five per cents, in the course of 30 years, would have amounted only to 101,721,266*l.*, and the free revenue would have been only 6,069,709*l.* In the third, which in fact is the plan adopted by Mr. Pitt, no other aid was proposed to the million surplus than the temporary and life-annuities as they fell in, and supposing the stock to have been redeemed in the three, four, and five per cents, in the manner directed by Dr. Price, it would have amounted, in 30 years only, to 73,379,126*l.* and the free revenue to 4,579,731*l.*, or to little more than two-thirds its amount by the first plan.

Since the establishment of this plan, it has been the custom of parliament to vote annually the sum of 200,000*l.* in addition to the million surplus, by which its operations have been so far accelerated. But on the other hand they have been retarded, for the purpose of assisting the public loans, by the partial, and at last the total alienation of the 30 years annuity, amounting to 418,333*l.* per annum.

When the sinking fund was established in the year 1786, the public debt, exclusive of the temporary annuities, consisted of

187,611,254*l.* in the three per cents,
32,750,000*l.* in the four per cents,
17,869,994*l.* in the five per cents;

amounting in the whole to 238,231,241*l.* By the operation of Dr. Price's plan, which was founded on a system of peace, and consequently on the supposition that in the course of a very few years the four per cents would have risen to par, the whole of that stock and of the five per cents, together with 4,074,574*l.* stock in the three per cents, would have been redeemed at the present time, leaving a free revenue of 3,892,831*l.* and reducing the permanent debt to 183,536,680*l.* stock in the three per cents, which would have required little more than five millions and a half annually to pay the interest of it. Nor have the operations of this plan disappointed the hopes and expectations of the public. They have in fact exceeded the computations of Dr. Price; but this has arisen from a cause by no means favourable either to the credit or the welfare of the country. By a ruinous war, in which the nation has been almost incessantly involved during the last 18 years, and which, by increasing the debt twenty times faster than it could possibly be reduced, has at different times depreciated the funds so low, that the sums appropriated for the redemption of the debt have purchased nearly twice as much stock as they would otherwise have done. From the manner, however, in which the accounts are laid before parliament, it is impossible to ascertain the exact amount of the debt which has been redeemed by the sinking fund, as it was first established in 1786; for its operations are blended with those of another fund which was established soon after, for the purpose of redeeming any new debt which should be incurred by the public.

In the several tracts which Dr. Price had written on the subject, he had strongly insisted on the necessity, not only of redeeming the present, but also of discharging any future debt, by providing a special fund for that purpose, and with that view he recommended that 1*l.* on every 100*l.* borrowed should be annually applied to the redemption of the capital, (which it would accomplish in less than 40 years,) that by this means the debt might be prevented from becoming a perpetual burden on the country. In conformity with this recommendation of Dr. Price an act of parliament was passed, which directed, that in all future loans an additional sum of 1*l.* per cent over and above the annual interest should be raised by taxes towards redeeming the principal, and so enormous has been the expenditure since the passing of that act, that this additional sum amounted, in February last (1810) to 3,841,567*l.* exclusive of 56,445,000*l.* which had been borrowed during Mr. Pitt's administration, on the security of the income-tax, and which has since been funded without any special provision for its redemption. With this sum, and the accumulating dividends on the stock purchased with it, together with the surplus million, the annual sum of 200,000*l.* voted by parliament, the dividends on the stock purchased with both, and about 91,000*l.* per ann. gained by the falling in of some life annuities, the commissioners had in February the sum of 10,509,392*l.* as an-

 nually

nually applicable to the reduction of the debt of Great Britain, and the whole of what they had then redeemed amounted to

149,271,236*l.* ftock in the three per cents,
6,629,700*l.* ftock in the four per cents,
142,000*l.* ftock in the five per cents, or 156,042,936*l.*

But in order to fhew what progrefs has really been made in reducing the public debt by the financial operations of minifters, it will be neceffary to obferve that the whole mafs, exclufive of the debt incurred in the prefent year and of the addition to the temporary annuities, amounted in February to

596,156,564*l.* ftock in the three per cents,
66,076,985*l.* ftock in the four per cents,
60,213,221*l.* ftock in the five per cents, or 722,446,770*l.*

Deducting from this fum 156,042,936*l.* purchafed by the commiffioners, there will remain unredeemed of the perpetual annuities 566,403,834*l.*; and as the purchafes have almoft wholly been made in the three per cents, a very confiderable part of this debt confifts of four and five per cents, which makes the real amount of it, when compared with the debt in 1786, nearly four times greater than what it would have been, had no wars intervened to difturb the operations of the finking fund.

In the courfe of the laft five years about 140 millions have been added to the capital of the public debt, which, requiring an annual addition of fix millions nearly to the permanent taxes, recourfe has been had, among a variety of other expedients for preventing the neceffity of impofing new burthens, to the perpetuating a part of the war-taxes which were meant only to be temporary, and to the alienation of the annuities that expired in 1808, which were originally to have been applied in aid of the finking fund. By thefe means, in conjunction with the meafure of funding above 56 millions of three per cents, without any provifion for their redemption; the country, fhould the prefent defolating war be ever fucceeded by an interval of peace, will neither be relieved immediately from the extraordinary weight of its new burthens, nor, as it ought to have been, from the length of time in which it is to bear its old ones.

In a former period, when the minifter began to encroach on the finking fund under pretence of relieving the public, he never ceafed to repeat his encroachments with increafing violence till he had entirely deftroyed it. In the prefent period we have witneffed fimilar encroachments from fimilar motives; and if the public expenditure fhould proceed in the courfe which has diftinguifhed this war above all others for a few years longer, it is not improbable that the fame fpecious pretence will be urged for repeating thofe encroachments; until at length the whole fund is alienated, and the laft hope of the country to be ever relieved from its burthens is totally extinguifhed.

FUND *for the Support of decayed Muficians and their Families.* This fund, the firft of the kind, has been the model of fimilar eftablifhments abroad and at home. On the continent it has been imitated at Vienna, Gottingen, Leipfic, and Hamburg; and at home, in our theatres. Mr. Garrick, when he had quitted the ftage, and only acted occafionally, eftablifhed a fund for the fupport of decayed actors and actreffes; and continued to perform a capital part for its benefit, annually, to nearly the laft year of his life. For this benefit he wrote, and fpoke, the moft humorous prologue, in a mock-heroic ftyle, which his fertile pen in addreffes to an audience ever produced. The fame laudable kind of fund for decayed and worn out actors and their families has been eftablifhed at Covent Garden.

The original fund for decayed muficians had its beginning in 1738, on a fmall fcale, by opening a fubfcription among mufical profeffors, of only half-a-crown a quarter; forming themfelves into a fociety, electing 12 governors, to be renewed annually, and agreeing to 14 refolutions, which are all inferted in the appendix to the account of the Commemoration of Handel, publifhed in 1785, 4to.

In 1739, a compact was formed with the corporation of "the Sons of the Clergy," by which the fociety engaged to furnifh a band, felected from their fubfcribing members, for the two annual performances at St. Paul's cathedral, in confideration of the fum of fifty pounds, which the corporation agreed to allow each year to the mufical fociety; and this fum has been conftantly thrown into the fund, and appropriated to charitable purpofes.

Befides the cafual and fluctuating income arifing from fubfcriptions and benefits, the fociety has been honoured with a few benefactions in the way of legacies, of which the following is an account:

In 1738, 100*l.* by Mr. Rojere, one of its profeffional members.

In 1760, 50*l.* by Mr. Waldron, do.

In 1782, 50*l.* by Mr. James Mathias, an honorary fubfcriber, with an excellent bafs voice; whofe performance as a dilettanti at the Crown and Anchor concerts was long admired.

But the moft confiderable legacy which the fociety ever received was from the admirable and benevolent Mr. Handel; who bequeathed to the eftablifhment 1000*l.*

From the performances at the commemoration of this great and illuftrious mufician, whofe works had been the chief attractions at their annual benefits, the fund received an addition to their capital from the noblemen and baronets who planned and directed this extraordinary celebration, 6000*l.*

At their annual benefits, the principal profeffional fubfcribers to the charity, who are not employed in the orcheftra, are appointed to attend at the feveral doors and offices of the theatre; the whole bufinefs being tranfacted by themfelves, as ordered and regulated by a committee for the concert, or whatever the perfomance may be; and it feems as if no charitable inftitution could be more out of the reach of abufe, embezzlement, or partiality; regulated with more care, integrity, and economy; or have its income fo immediately derived from the activity and talents of its own members.

Except a fmall falary to the fecretary, and another to the collector, there is no lucrative employment belonging to the inftitution: fo that the whole produce of benefits and fubfcriptions is nett, and clear of all deduction or drawback.

Though the firft fubfcription from profeffional members was only half-a-crown a quarter, in 1766 the fum of 20 fhillings per annum was required of all new members, inftead of ten. And the old members then agreed, almoft unanimoufly, to pay the fame fum. Since that period, the annual demand on the profeffional fubfcribers has been fettled at one pound two fhillings, and the benefit tickets have the fame price as at the Commemoration; that is to fay, a guinea each, fo that the fubfcription of honorary members has been doubled.

Mr. Michael Chriftian Fefting, and doctor Maurice Green, took the lead at the time of inftituting this fociety, and for twelve or fourteen years afterwards. Since their deceafe, other muficians, who were high in the profeffion, and of whofe probity and honour their brethren had a good opinion, were placed alternately in the chair, and now, by the

the great acceſſion to the fund from the profits of the ever memorable Commemoration, its capital becomes a ſerious and weighty concern, amounting to upwards of 22,000 *l.* in South-ſea annuities and three per cents, which realizes and aſcertains an income of 678 *l.* a year, excluſive of benefits or ſubſcriptions.

The path therefore which the governors and court of aſſiſtants have now to purſue is perfectly plain and pleaſant. The power of alleviating diſtreſs and miſery, of feeding the hungry, cloathing the naked, and adminiſtering comfort to age and infirmities, is placed in their hands without the trouble of providing the means.

FUNDAMENT, the anus or aperture through which an animal voids his excrements.

FUNDAMENTAL, ſomething that ſerves as a baſe, reſt, ſupport, or foundation, for any thing.

The apoſtles creed contains the fundamental points of religion. The Salic law is the fundamental law of the polity of France.

FUNDAMENTAL, in *Muſic*, denotes the principal note of a ſong or compoſition, to which all the reſt are in ſome meaſure adapted, and by which they are ſwayed; called alſo the *key* of the ſong.

FUNDAMENTAL *Baſs*. See BASSE *Fondamentale*, and FONDAMENTALE.

FUNDAMENTAL *Concords* are of three kinds; *viz.* the perfect concord, the concord of the ſixth, and the concord of the ſeventh. The firſt or perfect concord is greater or leſs, according as the third is greater or leſs. The ſecond is of three ſorts: in the two firſt ſorts the ſixth is always greater, and the third greater or leſs, as the mode is greater or leſs. Theſe two concords differ only by their third. Between theſe two there is another concord, which on many occaſions produces a very good effect, and is particularly uſed by the Italians; whence it is called the concord of the ſuperfluous ſixth, or of the Italian ſixth. It is compoſed of a greater third, or ſuperfluous fourth, or tritone, and a greater third, as *fa la ſi re* ※. There are ſeveral kinds of the fundamental ſeventh: the firſt is formed of a greater third, and two leſſer thirds, as *ſol ſi re fa*; the ſecond is formed of a leſſer third, a greater third, and a leſſer third, as *re fa la ut*; the third is formed of two leſſer thirds, and a greater third, as *ſi re fa la*; the fourth is formed of one greater third, one leſſer, and one greater, as *ut mi ſol ſi*; the fifth is called the concord of the diminiſhed ſeventh, and formed of three leſſer thirds, *ſo* ※ *ſi re fa*. See CONCORD.

FUNDAMENTAL *Rock*, in *Geology*, (or baſis,) is a term uſed by Mr. Kirwan, and by many of the German geologiſts, for the baſis or ſolid nucleus of the earth, on which the ſuperficial ſtrata have been depoſited. This fundamental rock is ſaid to be granite, but we much doubt the truth of this poſition, except ſo far as it may abound in the lower part of the ſeries of ſtrata viſible on the ſurface; becauſe an immenſe maſs of matter, much heavier than granite, is neceſſary, in the central parts of the earth, to account for the ſpecific gravity (4.4 to 5.4) which modern and concurrent experiments have ſhewn to belong to the terraqueous globe. See EARTH and GRAVITY.

FUNDAMENTO, in the *Italian Muſic*, is in general every part that plays or ſings the baſs; but the thorough-baſs is more particularly ſo called, becauſe it is the baſis or foundation of all harmony.

FUNDAON, in *Geography*, a town of Portugal, in the province of Beira; 22 miles W. of Alfayates.

FUNDI. See FONDI.

FUNDO, a town of European Turkey, in Moldavia; 44 miles W.N.W. of Birlat.

FUNDUCLÆ, an Ægyptian coin, a ſort of ſequin, of the value of a hundred and forty-ſix medines. Pococke's Egypt, p. 175.

FUNDULUS, in *Zoology*, a name uſed by many for the ſmall fiſh, called by others *cobitis barbatula*, and by the generality of people in England the *loach*.

FUNDULUS is uſed alſo by Schoneveldt, and ſome others, to expreſs the common gudgeon, or CYPRINUS *gobio*.

FUNDY, in *Geography*, a large bay in North America, which opens between the iſlands in Penobſcot bay, in the county of Lincoln and ſtate of Maine, and Cape Sable, the ſouth-weſtern point of Nova Scotia. It extends about 200 miles in a N.E. direction; and with Verte bay, which projects into the land in a S.W. direction from the ſtraits of Northumberland, forms a very narrow iſthmus, uniting Nova Scotia to the continent, where the diviſion line runs between that province and New Brunſwick. From its mouth up to Paſſamaquoddy bay, on its N.W. ſide, ſituated between the province of New Brunſwick and the diſtrict of Maine, are a number of bays and iſlands on both ſides, and thus far it contracts its breadth gradually. It is 12 leagues acroſs from St. John's in New Brunſwick to the gut of Annapolis, in Nova Scotia, where the tides are rapid, and riſe 30 feet. Above this it preſerves nearly an equal breadth, until its waters are formed into two arms by a peninſula, the weſtern point of which is called Cape Chigneeto. At the head of the north-eaſtern arm, called Chigneeto channel, which forms with bay Verte the iſthmus, the tides riſe 40 feet. Theſe tides are ſo rapid as to overtake animals feeding on the ſhore.

FUNEN, or FYEN, an iſland of Denmark, at the entrance of the Baltic, nearly of an oval form, extending from N. to S. about 35 miles, and from E. to W. about 30; it is a fertile and pleaſant iſland, in which many of the Daniſh nobility have ſeats. The ſoil yields great crops of corn, ſo that nearly 10,000 barrels are exported annually to Norway and Sweden, excluſively of the home-conſumption. The inhabitants keep large ſtocks of bees, and with the honey they make mead, which forms a conſiderable article of trade. In this iſland are ſeveral lakes and rivers abounding in fiſh, but none of them are navigable: great quantities of cod, herring, turbot, and other fiſh are caught in the bays along the coaſt. The capital is Odenſee. N. lat. 55° 7′ to 55° 36′. E. long. 9° 40′ to 10° 50′.

FUNERAL, the ceremonies performed at an interment; or the laſt offices paid to the deceaſed. See BURIAL.

The word is formed of the Latin *funus*; and that of *funalia*, on account of the torches (which were *funes, cera circumdati*) uſed in the funerals of the Romans; though others derive *funus* from the Greek φονος, *death* or *ſlaughter*.

The firſt perſons who ſeem to have paid any particular reſpect to their dead were the Egyptians, who erected monuments for tranſmitting the remembrance of their virtues to future ages. See PYRAMID.

Whenever a perſon died among the Egyptians, his parents and friends put on mournful habits, and abſtained from all banquets and entertainments. This mourning laſted from forty to ſeventy days, during which time they embalmed the body. See EMBALMING.

When this ceremony was finiſhed, the embalmed body was reſtored to the parents, who placed it in a kind of open cheſt, which was preſerved either in their houſes, or in the ſepulchres of their anceſtors. Before the dead were allowed to be depoſited in the tomb, they underwent a ſolemn judgment, which extended even to their kings; and if the iſſue of the judgment proved unfavourable, they were deprived of the rights of burial; and this cuſtom ſeems

to have been practised among the Israelites; for we read that their wicked kings were not interred in the sepulchres of their ancestors.

The funeral rites among the ancient Romans were very numerous. The deceased was kept seven days; and every day washed with hot water, and sometimes with oil, that, in case he were only in a slumber, he might be thus waked; and every now and then his friends meeting, made a horrible outcry or shout, with the same view; which last action they called *conclamatio*.

The third conclamation was on the seventh day; when, if no signs of life appeared, the defunct was dressed and embalmed by the pollinctories: placed in a bed near the door, with his face and heels towards the street; and the outside of the gate, if the deceased were of condition, was garnished with cypress boughs.

In the course of these seven days an altar was raised near his bed-side, called *acerra;* on which his friends every day offered incense; and the libitinarii provided things for the funeral.

On the seventh day a crier was sent about the city to invite the people to the solemnization of the funeral in these words: "Exequias L. Tit. L. filii, quibus est commodum ire, jam tempus est. Ollus (i. e. ille) ex ædibus effertur."

The people being assembled, the last conclamation ended, and the bed was covered with purple; a trumpeter marched forth, followed by old women, called *præficæ*, singing songs in praise of the deceased; and lastly, the bed followed, borne by the next relations. And if the person were of quality and office, the waxen images of all his predecessors were carried before him on poles.

The bed was followed by his children, kindred, &c. *atrati*, or in mourning: from which act of following the corpse, these funeral rites were called *exequiæ*.

The body thus brought to the rostra, the next of kin *laudabat defunctum pro rostris*, made a funeral oration in his praise, and that of his ancestors.

This done, the body was carried to the *pyra*, or funeral pile, and there burnt: his friends first cutting off a finger, to be buried with a second solemnity.

The body consumed, the ashes were gathered: and the priest sprinkling the company thrice with clean water, the eldest of the *præficæ* crying aloud, *ilicet*, dismissed the people, who took their leave of the deceased in this form, "Vale, vale, vale: nos te ordine quo natura premiserit, sequemur."

The ashes, inclosed in an urn, were laid in the sepulchre, or tomb. The first Romans did not burn their dead, but interred them as we do. Pliny, lib. vii. cap. 54. assures us, that the custom of burning was not introduced till after they had learnt that their enemies dug up, and exposed, the bodies of their soldiers buried in remote countries. And yet Plutarch, in his life of Numa, observes that Numa was buried; as having expressly forbade them, by his testament, to burn: this shews that the Romans had practised burning before his time.

This custom of burning the dead, so religiously observed by the Greeks and Romans, was held in abhorrence by several other nations.

Herodotus relates, that the Persians detested it, as holding fire to be a god. The Egyptians declined to burn their dead, as taking fire for an inanimate beast, and judging it impiety to commit the bodies of the deceased to be devoured by beasts. The custom of burning among the Romans ceased under the empire of the Antonines. See BURNING and MOURNING.

In the Romish church, when a person is dead, they wash the body, and put a crucifix in its hand. At its feet stands a vessel of holy water, that they who come in may sprinkle both themselves and the deceased. In the mean time some priest stands by the corpse, and prays for the deceased till it is laid in the earth. In the funeral procession the exorcist walks first, carrying the holy water, next the cross-bearer, afterwards the rest of the clergy, and last of all the officiating priest. They sing the *miserere*, and some of the Psalms; and at the end of each Psalm, a *requiem* We learn from Alet's ritual, that the faces of deceased laymen must be turned towards the altar when they are placed in the church; and those of the clergy towards the people. The corpse is placed in the church, surrounded with lighted tapers; after the office for the dead mass is said; then the officiating priest sprinkles the corpse thrice with holy water, and as often throws incense on it. The body being laid in the grave, the friends and relations sprinkle the grave with holy water.

FUNERAL *Charges* are not allowable against a creditor, except for the coffin, ringing the bell, parson, clerk, and bearers fees, but not for the pall and ornaments. See DEBT and EXECUTOR.

FUNERAL *Column*. See *Funeral* COLUMN.

FUNERAL *Games*, *ludi funebres*, were a part of the ceremony of the ancient funerals.

They consisted chiefly in processions, and sometimes in mortal combats of gladiators around the funeral pile.

The custom was very ancient, though it had not always been the same. At first they cut the throats of a number of captives before the pyra, as victims to appease the manes of the deceased. This Achilles does in Homer, Iliad Φ, at the funeral of Patroclus; and Æneas, in Virgil, lib. ix. at that of Pallas, son of Evander. Cæsar, in his Commentaries, lib. viii. relates, that the Gauls also did the like.

But at length it appeared barbarous thus to butcher man; and therefore to save the horror of the spectacle, yet without the dead's losing any thing thereby, they made the poor captives fight and kill one another, only saving some few of such as came off victors.

This custom was borrowed from the Greeks by the Romans; among whom the cruel diversion was called *munus*.

The first who introduced it at Rome was Junius Brutus, at the obsequies of his father; or, according to others, Ap. Claudius, and M. Fulvius, during their consulate.

The like horrible combats were also occasionally exhibited by the magistrates; and sometimes they were added to the theatrical pieces.

The emperor Claudius decreed, that whereas these accursed games were till then frequent and arbitrary; it should be the practice, for the future, only to perform them regularly every year at the expence of the state; and that the ædiles should have the care and direction thereof. But he conceived a horror for them himself, and soon after abolished them; though it was still allowed particular persons to have them, provided they were worth forty thousand sesterces per annum. They were not finally abolished before the time of Theodoric king of the Goths, at the end of the fifth century.

FUNERAL *Honours*. See HONOURS.

FUNERAL, *Military*, is usually attended with many solemnities, such as cannot fail to prove deeply impressive on the minds of the spectators, and to evince the respect in which the deceased was held. The funeral of an officer high in rank generally forms an extensive procession of horse and foot;

foot; on fuch occafions the garrifons, or detachments they commanded, parade, and a portion, defignated the "funeral party," precede the corpfe in open order, with their arms reverfed, the drums muffled, and the band playing the dead march, or fome folemn airs, fuited to the occafion. The officers, in lieu of leading, follow their feveral divifions; all wearing crapes both on the left arm and on their fwords: the fenior corps and the fenior officers being refpectively neareft the corpfe. The pall is fupported by officers of equal, or of fuperior rank to the deceafed, whofe fword and fafh are laid on the lid of the coffin. In many inftances the union colours of the regiment are borne as a pall, being previoufly difengaged from the ftaff. The chief mourners, among whom are commonly the officer on whom the command devolves, together with the ftaff of the deceafed, and of the ftation, &c. follow the corpfe, and the whole ufually pafs through a lane formed by the feveral regiments wearing their fide arms, which, as foon as they have proceeded, clofe and follow in order. On arriving near the place of interment, the lane is again formed, and the funeral party open to the right and left, refting on their arms reverfed in a forrowful pofition. The corpfe and mourners having moved beyond them, they again form and follow to the grave, near which, during the fervice, they remain at ordered, or reverfed, arms, and conclude the ceremony by firing three vollies over the corpfe, as the earth is filling over it. During the whole time the colours of the fortrefs are lowered to half-maft high, and minute guns are fired, correfponding in number with the years of the deceafed.

To officers of inferior rank proportionate honours are paid; thofe who commanded regiments being fired over by their flank companies, and attended by the refidue as mourners. Captains are ufually attended by their own companies as funeral parties, and by a proportion of others as mourners: fubalterns by fmall parties to fire over, and the refidue of the company as mourners. Even a private foldier has a funeral party of a ferjeant, a corporal, and twelve men; and if his conduct while living gave fatisfaction, moft of the company will be feen to attend. On fome occafions, non-commiffioned officers and privates have been fo highly efteemed as occafion their mournful followers to be very numerous.

Naval funerals depend much on circumftances: where they take place in any friendly port, the corpfe is generally fent afhore to be interred according to the forms above defcribed, the marines furnifhing the funeral party, and a fuitable number of officers attending to bear the pall, together with feamen to bear the coffin, and to follow as mourners. When an officer of high rank is to be interred, the enfign of the fhip, and the flag of the deceafed, are lowered half way down their refpective ftaves; the barge conveying the corpfe is hung with black, and the rowers wear crapes, &c. The band, which in thefe, as well as in military funerals, has its inftruments furnifhed with black ribbon, the drums being muffled and covered with black crape, perform folemn mufic. All the fhips in port lower their colours to half maft, and the fhip from which the corpfe proceeds to the fhore, in particular, fires minute guns.

At fea, and in an enemy's harbour, fuch a mode of interment cannot take place, therefore the body, if not preferved for the purpofe of being buried afhore, muft be fewed up in a hammock, which may again be cafed either in black woollen, &c. or in a wooden fhell; being duly laden with fhot, or any ponderous fubftance, it is laid upon a grating taken from one of the hatchways, and laid upon the lee-gunnel. There the ufual fervice is performed by the chaplain, or, for want of one, by fome officer, and the corpfe is launched into the deep. It is fometimes the practice to fit out the fhip's barge, or her long-boat, &c. on fuch occafions, and to caufe the body to be rowed from fhip to fhip, receiving from each fome token of refpect, fuch as manning the rigging in filence, lowering the colours to half maft, performing folemn mufic, and occafionally by firing a certain number of guns. The fervice is concluded in the boat bearing the corpfe, which is then configned to the deep.

It is not eafy to defcribe the decorum which prevails on thefe occafions, nor to give an adequate idea of the impreffion made on a very large portion of any crew lofing an agreeable companion. His configmment to "Davy Jones's Locker," as it is technically called, produces much affliction among thofe who were his immediate meffmates, who eye his fpoon, which often becomes a facred relic, as it remains unufed in the common bracket, with far more emotion than, from a fuperficial acquaintance with the naval character, one fhould expect to witnefs. The abfence of a fellow-feaman, who, according to the common phrafe, has "ftuck up his fpoon," cannot be unnoticed; every thing calls the loft affociate back to the memory, in which his good qualities are fure to be indelibly recorded!

FUNERAL *Oration*, or *Sermon*, a difcourfe pronounced in praife of a perfon deceafed, at the ceremony of his funeral.

The cuftom of making funeral orations is very ancient. The Romans had it of a long ftanding; and it was always one of the neareft relations that made the harangue. Auguftus did the office to his grandmother Julia, when only twelve years of age. Suet. Aug. cap. 8. And we have divers parallel inftances.

The cuftom feems to have begun with the republic; at leaft, the firft funeral oration we read of was that of Brutus, who expelled the kings, and was the firft conful; who having been killed in a battle againft the Etrurians, *laudabatur pro roftris*, was praifed in the forum by Valerius Publicola his colleague.

Indeed, fome authors will have the practice more ancient. They maintain it to have been in ufe among the Greeks; and that Solon, who, according to Aulus Gellius, gave laws to the Athenians, in the time when the elder Tarquin reigned in Rome, was the firft author thereof; fomething like which, it feems, the orator Anaximenes has left in writing. See Polydore Virgil De Invent. Rer. lib. iii. cap. 10. See DEMONSTRATIVE.

FUNES, in *Geography*, a town of South America, in the province of Popayan; 15 miles S. of Pafto.

FUNFKIRCEN, or *Five Churches*, a town of Hungary, fituated in a fertile foil between the Drave and the Danube, the fee of a bifhop. An univerfity was founded in this place by Louis I., and it had at one time 2000 ftudents; but when the Turks obtained poffeffion of the town, the univerfity declined, and it has never fince recovered. The number of its inhabitants is about 12,000; 110 miles W. of Belgrade. N. lat. 46° 6'. E. long. 18° 9'.

FUNGENO, or FUNGANDO, a kingdom of Africa, fituated between the Zaire and the Coanza, fubject to Anziko.

FUNGI, in *Botany*, a Natural Order of Plants, the fourth of the clafs *Cryptogamia*, as originally eftablifhed by Linnæus, is reckoned among the *Acotyledones* by Juffieu. This order includes all thofe productions commonly known by the name of Mufhrooms, as well as a numerous tribe of fimilar vegetable bodies, differing in firmnefs from a watery pulp of very fhort duration, to a leathery or even woody texture, often very permanent. They cannot properly be faid to have any herbage, much lefs any thing like leaves or flowers in appearance, however their different parts may

perform

perform functions analogous to what are proper to fuch organs. Acharius, like many of his predeceffors, reckons them deftitute of fexual organs, or any thing analogous to *ftamina* and *piftilla*; but this opinion is altogether theoretical, like the affertion of Juffieu, which denies them cotyledons. Neither has been proved, nor is either of any practical ufe, for the purpofes of fyftematical arrangement. Some have thought *Fungi* to be of an animal nature, becaufe of their fœtid fcent in decay, and becaufe they are occafionally the habitations of infects, which were fuppofed to form them as polypes do corals, an idea fcarce worthy of refutation. The fuppofition maintained by fome, of their originating from the tranfmuted fap of corrupted wood, is equally futile. They are in fact as diftinct in genus and fpecies as any other vegetables, and propagate themfelves as regularly, though, like other plants, fubject to varieties.

Dryander, Schæffer, and Hedwig, have afferted their vegetable nature, and in many inftances demonftrated their feeds; in fome cafes their organs of impregnation have been, with great probability, pointed out.

The chief writers on *Fungi* are Schæffer, Batarra, Bulliard, Sowerby, Schrader, Tode, and Perfoon, the latter being the beft fyftematic author in this department. He divides them into two principal fections. 1. *Angiocarpi*, bearing their feeds internally, like the *Lycoperdon*, or Puffball; and 2. *Gymnocarpi*, whofe feeds are imbedded in an appropriate, dilated, expofed membrane, called *hymenium*, of which the common eatable mufhroom, *Agaricus pratenfis*, is an example. In this genus, *Agaricus*, the *hymenium* confifts of parallel plates, termed gills.

Fungi *efculenti*. See Phallus.

FUNGIFER Lapis, the *mufhroom-bearing ftone*, a name given by authors to a coarfe ftone found in Italy, and many other places, lying near the furface of the earth, which they fay will at any time produce mufhrooms, on being moiftened with warm water.

FUNGITÆ, in *Natural Hiftory*, a name given by authors to a fpecies of fea-coral, often found adhering to fea-fhells, or to the larger corals in its recent ftate, and very often found alfo foffile, or buried at great depths in the earth; they are ufually immerged in ftone, and fometimes in clay. The more frequent of thefe are of a conic fhape; fometimes they are flatted and difcoid, and ufually ftriated longitudinally; they fometimes are found in their foffil ftate adhering to fhells or corals, but more ufually feparate. To this, and fome other bodies of this kind, Mr. Lloyd has given the name *columella*; to one of them, that of *branchiale*, from its refembling the gills of a fifh; and to another, that of *undulago*, from its undulated figure. Mr. William Martin, (Outlines, &c. p. 83.) a late writer, who feems to have ftudied the fubject of extraneous foffils or reliquia, as he calls them, with the beft effect, confiders the exiftence of petrified fungi as extremely doubtful, and refers fuch fpecimens as he has examined to the clafs of coralline bodies, to which they feem evidently to belong.

FUNGITES, a fpecies of *Madrepora*; which fee.

FUNGOIDASTER. See Hevella.

FUNGOIDES. See Agaricus, Clavaria, Helvella, and Peziza.

FUNGOUS Flesh, is a fpongeous excrefcence, or (as we popularly call it) *proud flefh*, frequently growing on the lips of wounds, ulcers, &c. See Fungus.

Fungous *Tumours*. See Tumours.

FUNGUS, in *Mineralogy*, a name given by Dr. Lifter to a blackifh bituminous fubftance, found in fome of the mines of Derbyfhire. It adheres to the fides of the fiffures of rocks, and lies in feams of the ftrata. It is of a blackifh colour, and fatty fubftance, which never dries in the air, but always remains as moift as when taken out of the mine. Some maffes of it are foft and like a jelly, others are hard and firm, and in thefe there are feveral lumps of pure bitumen in many parts. This is inflammable like refin. It is light, but breaks finer, and fhines like good aloes when frefh broken, but that it is a little darker coloured, and has fome tinge of purple in it. In fome pieces the purple is wanting, and there is a green in the place of it. On being diftilled, it yields firft a limpid and infipid water, then a whitifh water of a fharp tafte, and finally a yellow and clear oil, much refembling oil of amber, but the procefs affords no volatile falt in the neck of the receiver, in which it differs from amber when treated in the fame manner. Phil. Tranf. N° 6.

Fungus, in *Natural Hiftory*. See Fungi, Madrepora, and Mushroom.

Fungus, in *Surgery*, fignifies a fpongy excrefcence, which is generally compofed of large, high, flabby, fometimes firm, granulations, and is apt to bleed from flight caufes, being attended with various degrees of pain in different cafes and under different circumftances. As the difeafe confifts of an organized, vafcular fubftance, it is commonly its nature to continue to become larger and larger, unlefs its growth be ftopped by fome decifive method of treatment on the part of the furgeon. It is almoft impoffible for us to give the reader an adequate idea of the mifery and dreadful fufferings which certain fungous difeafes bring upon mankind. Some of thefe excrefcences, it is true, are only attended with flight inconvenience and occafional pain; but many others, befides being at all times horridly painful, reduce the unhappy patient to the extreme ftate of debility, partly by producing repeated hemorrhages, and partly by occafioning lofs of reft, fever, &c. Some fungous difeafes affume a malignant character, becoming cancerous, or, (if poffible) worfe than a cancer, fo that fhould they be too extenfive for extirpation, the confequences muft be fatal.

In the article Dura Mater, *Tumours of*, we have defcribed one fpecies of fungus which grows from the dura mater, makes its way outward by producing an abforption of the tables of the fkull, lifts up the fcalp, and, at length, ulcerates the fkin fo as to protrude at fome part of the head, quite free from every kind of covering. Such fwellings have fometimes been fuccefsfully deftroyed; but, too frequently, they affect the brain underneath and prove fatal. The reader, however, is referred for an account of this fubject to the above-mentioned article.

A milder and lefs alarming form of fungus is feen in fuch excrefcences as the ficus, condyloma, &c. which frequently occur about the anus, perinæum, and pudenda. The manner of curing thefe difeafes we have defcribed under the head of Excrescence.

Fungous excrefcences are not confined to any particular parts or ftructures; they may originate in almoft any fituation in the body. However, there are certain circumftances which are particularly often attended with the appearance of a fungus. When a furgeon, in removing an encyfted tumour, leaves a portion of the cyft behind, a fungus is very apt to grow from the furface of this latter part, and prove a great deal more troublefome than the previous fwelling. After the operation of removing a cancerous eye, a malignant fungus often arifes from the bottom of the orbit, increafes notwithftanding the moft able interference of the furgeon, affects the brain, and deftroys the patient. After cutting out a circular piece of the fkull with a trephine, and expofing the dura mater, it fometimes happens

happens that a dangerous fungus ſhoots up from the outer ſurface of the latter membrane. Whenever there is a diſeaſed or exfoliating portion of bone under any ſore, fungous granulations are particularly prone to appear, and, in this inſtance, the cure depends on the ſeparation of the morbid part underneath. When a ſurgeon ventures to cut away any tumour, which is growing cloſely connected with a tendinous expanſion, he ſhould be on his guard againſt the production of a fungus. This remark ſhould be remembered, after taking away ganglions with a cutting inſtrument. After operations for cancerous diſeaſes, the appearance of a fungus is the principal uneaſineſs of every well-informed practitioner, who, in beholding the high, luxuriant, ſpongy granulations, recognizes the recurrence of the fatal diſtemper.

Before entering into the conſideration of ſeveral important fungous diſeaſes, which form the chief ſubject of the preſent article, we have to remark, that the treatment of a fungus, whatever be the ſpecies, generally conſiſts in attempting to extirpate it. For the moſt part, the ſooner ſuch endeavour is made, the more likely it is to ſucceed, and the leſs formidable is the operation. The extirpation is effected ſometimes with a cutting inſtrument, ſometimes with cauſtic, ſometimes with a ligature. In former times, the actual cautery was much employed for this purpoſe, and it appears to be not altogether abandoned in France even in our own times; but, by the general conſent of all reſpectable practitioners, hot irons have long been diſuſed in the practice of ſurgery in England.

Fungus of the Antrum.—Anatomy teaches us, that the antrum is a conſiderable cavity, ſituated in the upper jaw-bone, between the lower part of the orbit and the roof of the mouth, having an aperture, by which it communicates with the inſide of the noſe, and being lined with a production of the Schneiderian membrane.

Fungous diſeaſes of the antrum are amongſt the moſt terrible to which human nature is ſubject. The dreadful ſufferings and extenſive miſchief which a tumour of this deſcription may induce, have been excellently depicted in the following narrative. M. T. David, fifty years of age, experienced for two years a degree of violent pain, which he referred to the two large molar teeth of the right ſide of the upper jaw. Theſe teeth were extracted in the month of September, 1790, without any relief being obtained. Towards the end of February, 1791, the cheek of the ſame ſide was affected with ſwelling and pain. A ſhort time afterwards, a ſoft ſmall eminence appeared above the tuberoſity of the cheek-bone, and, as it increaſed rapidly, the patient was determined to try to get into the Hôtel-Dieu on the 30th of the following April. At this period the whole cheek was ſwelled, red, and painful; the tumour on the cheek-bone was about two inches in diameter, and, by projecting into the orbit, had puſhed the globe of the eye upwards and backwards. A portion of the fungus filled up the right noſtril, puſhed the ſeptum naſi to one ſide, and protruded to the extent of half an inch from the anterior opening. That part of the alveolar proceſs, from which the teeth had been extracted, being depreſſed below the level of the remaining teeth, rendered maſtication extremely difficult. From the weakneſs and advanced age of the patient little hope of a cure was entertained. With a view of palliating the pain in the cheek, compreſſes, moiſtened with the lotio aquæ lithargyri acetati, were applied.

During the firſt fortnight, the ſwelling over the cheek-bone only underwent a trivial augmentation; but the fungus increaſed with great rapidity. It extended towards the back part of the noſtrils, depreſſed the arch of the palate, and deformed the noſe ſo much, that it could ſcarcely be diſtinguiſhed from the cheek. The pains became more and more aggravated, and, at laſt, deprived the patient of her ſleep. Toward the end of the firſt month, that portion of the fungus which had paſſed out of the right noſtril returned into the noſe. The tumour alſo, which projected into the mouth, partly diſappeared; but the ſwelling on the tuberoſity of the cheek-bone conſiderably increaſed. The eye-ball ſoon became entirely concealed in the orbit; the ſkin of the cheek became gradually thin, and, at length, burſt by a ſmall opening ſituated under the great angle of the orbit. From this orifice a great quantity of reddiſh ſanies was diſcharged. A fortnight afterwards, an ulceration took place at the top of this tumour, and gave vent to a putrid and very irritating ſanies. The pains now extended towards the ear, from which flowed a quantity of fœtid, blackiſh pus. The ulcer produced a deep excavation in the cheek, which, in leſs than ten days, was entirely deſtroyed. A colliquative diarrhœa now came on, and the patient died in a ſtate of maraſmus on the 4th of July, ten weeks after her admiſſion, and three years from the commencement of her complaint. On diſſection, the muſcles of the right ſide of her face were found reduced to a thick yellow cellular maſs. The pterygoid, maſſeter, and temporal muſcles were in part deſtroyed, as it is ſaid, by the corroſive action of the ſanious diſcharge, which even made an impreſſion on the finger. The ligaments which connected the lower jaw to the temporal bone were deſtroyed, and the pus paſſed through an opening from this articulation into the meatus auditorius externus. The right portion of the palatine arch, and three-fourths of the poſterior alveolar proceſs, were of the conſiſtence of cartilage. The external part of the orbit was deſtroyed by the fungus. The apophyſis of the maxillary bone was diſlocated, and, in part, deſtroyed. The articulation of the cheek-bone with the temporal bone was ſo nearly annihilated, that there only remained a connection by means of a thin lamina, in which were ſeveral openings. The right partition of the naſal foſſa was deſtroyed, and the antrum formed with the noſe one large cavity. See Deſault's Pariſian Chirurgical Journal, vol. ii.

Such is the dreadful progreſs of fungous tumours of the antrum, when left to themſelves, and unreſiſted by the ſalutary and timely interference of ſurgery. One ſingle example, indeed, is inſufficient for conveying a full idea of the ravages which may be occaſioned by the increaſe of the fungus and its preſſure on the ſurrounding parts. In ſome caſes, the ſwelling prevents the tears from paſſing down into the noſe, raiſes the lower part of the orbit, cauſes a protruſion of the eye, occaſions an irremediable loſs of ſight, makes the grinding teeth fall out, obliterates the neighbouring noſtril, and produces an expanſion and a partial abſorption of the bony parietes of the antrum itſelf. The ſufferings of a patient afflicted in this manner baffle deſcription. His head-aches are terrible and inceſſant; he breathes with difficulty; he is deprived of his ſleep and appetite; he lingers in a miſerable ſtate of weakneſs, loathſomeneſs, deformity and pain, and dies at once an object of pity and diſguſt.

Fungi of the antrum are not diſeaſes with which we can tamper or play with impunity. They are not caſes which hold forth any chance of ſpontaneous amendment or cure. On the contrary, it is their nature to grow continually worſe, and to bring on the fatal termination which happened in the inſtance above related. Knowing theſe things, every ſurgeon who values his own profeſſional reputation, or the life

life of his patient, will immediately make up his mind to act with promptitude and decifion. In the early period of the difeafe the tumour itfelf is the only thing which requires removal; but after the fwelling has brought on the train of ravages which we have above enumerated, a cure cannot be accomplifhed in fo eafy a manner. We may, indeed, take away the fungus, and put a ftop to the increafing mifchief; yet many of the changes which have been occafioned muft take a long time to be rectified, and fome of the effects, fuch as the deftruction of the fight, may have become totally incurable.

The longer the diftemper has exifted, the more extenfive will generally be the furrounding mifchief, and the more likely will the fungus be to grow again. Even when this reproduction of the excrefcence does not happen, many months and years will often be required for the completion of the cure, the feparation of the exfoliations, the healing of ulcers and finufes, and the re-eftablifhment of the health.

After ftating thefe circumftances, it becomes almoft fuperfluous to enjoin furgeons to endeavour to difcover the difeafe in its infancy, and to attack it in this ftate with powerful and effectual means.

Fungi of the antrum appear frequently to originate from the irritation of carious teeth in the upper jaw. From this caufe, from bad colds in particular habits, from blows, or on fome other inexplicable account, we conceive that the Schneiderian membrane which lines the cavity is inflamed, throws out coagulating lymph, and emits the deftructive fungous excrefcence.

Now, by reafon of the concealed fituation of fuch a tumour, it muft be fomewhat difficult to make out the nature of the affection before it has made a certain progrefs, efpecially as the complaints are ufually regarded at firft as common tooth-achs, or mere rheumatic pains of the face.

Hence, whenever a practitioner is confulted for thefe cafes, he fhould at leaft take the trouble to afk a few prudent queftions; for notwithftanding the invifible fituation of a fungus in the antrum, it is well known among all well-informed furgeons that fuch a diftemper feldom exifts without being attended with fome affections of the adjacent parts. It is by confidering thefe latter complaints that we are led to fufpect a tumour in the antrum, and that we are fometimes enabled to afcertain its prefence before it has become fo large as to occafion much disfigurement of the face, or any alarming degree of furrounding mifchief. The furgeon fhould enquire whether any of the teeth have become loofe, or have fpontaneoufly fallen out; whether the alveolar procefs is found; whether there are any fungous granulations making their appearance at the fockets of fuch teeth as may have dropped out of, or been extracted from the upper jaw; whether there is any difcharge of fanies, or matter from the nofe, &c. Whenever fuch fymptoms prevail, there is great reafon to fufpect that a fungus exifts in the antrum, and the furgeon fhould not remain inactive, till the bones of the face begin to fwell, fungi protrude through the fkin of the cheek, the eye is difplaced, the ductus nafalis obftructed, and the furrounding mifchief has become alarmingly extenfive.

If the patient, with any of the preceding grounds of fufpicion, fhould labour under violent and long-continued pain in the fituation of the upper jaw-bone, after having had bad teeth, a fevere cold, or a blow on the face, the practitioner is called upon to make an opening into the antrum, for the purpofe of being able to get at the very root of the tumour.

There are two fituations in which the furgeon may effect this object. One is to make a perforation with a gimblet, or fome fuch inftrument, through the focket of any difeafed grinding tooth which may happen to be fituated under the antrum, and which of courfe muft be in the firft inftance extracted. We need not dwell upon the propriety of taking out a carious tooth in thefe cafes inftead of a found one. When none of the teeth are bad, which will very feldom happen with a fungus in the antrum, and when the furgeon is determined to make an opening by drawing one of the teeth, and perforating the bottom of the focket, his beft plan is to extract the third or fourth grinder, reckoning from before backward.

We will not pofitively condemn the plan of making an opening into the antrum in the foregoing way. It may be right in the firft inftance, before the furgeon is certain whether the difeafe is a tumour or an abfcefs in that cavity; becaufe, in the latter event, the method will be likely to anfwer every purpofe; and fhould there be a fungus prefent, the removal of a bad tooth, and perforation of the focket, cannot do any harm. Indeed we may advife, as a general practice, that in every inftance in which a patient fuffers violent pain in the face, and has any carious teeth, thefe fhould always be taken out without the leaft delay.

Although we have not ventured to diffuade practitioners altogether from taking this mode of making an opening into the antrum, we have no hefitation in declaring, that, in the event of there being a fungus in that cavity, fuch an opening will not be ample enough to enable the furgeon to put in execution the beft meafures for the effectual extirpation of the tumour; he may, indeed, by means of the perforation, give vent to fome fanies, afcertain that the cafe is not an abfcefs, difturb the excrefcence with his probe, &c.; but he will not be able to attack the difeafe at its root, and unlefs this be done, he had better remain quiet. The only reafons, therefore, in favour of making, in the firft inftance, a perforation through the alveolar procefs, are, that the furgeon may learn with certainty that the cafe is not an abfcefs, and that the patient, at all events, thus gets rid of a carious tooth, which may be looked upon as a fource of irritation and pain.

As foon as the furgeon is convinced of the exiftence of a fungus in the antrum, he fhould immediately decide to make fuch a free expofure of the excrefcence as will enable him to put in practice its effectual extirpation. Let him at once determine to imitate the immortal Default in decifion and boldnefs in thefe urgent cafes, to tamper and play with which is even far more culpable and abfurd than leaving the unhappy patient to his own fate.

Default had a patient with a fungus, which had grown in the antrum, diftended the parietes of that cavity, hindered the tears from paffing down into the nofe, raifed the lower part of the orbit, caufed a protrufion of the eye, made two of the grinding teeth fall out, and caufed in the anterior part of the antrum a cavity, from which a portion of the excrefcence projected. The following was the plan of treatment, which was fuccefsfully adopted. The cheek was firft detached from the os maxillare, by dividing the internal membrane of the mouth, at the place where it is reflected over this bone. Thus, the outer furface of the bone was denuded of all the foft parts. A fharp, perforating inftrument was applied to the middle of this furface, and an opening made more forward than the one already exifting. The plate of bone, fituated between the two apertures, was removed with a little falciform knife, which, being directed from behind forward, made the divifion without difficulty. The opening, thus obtained, being infufficient, Default endeavoured to enlarge it below, by facri-

ficing the alveolary procefs. This he endeavoured to accomplifh with the fame inftrument, but finding the refiftance too great, he had recourfe to a gouge and mallet. A confiderable piece of the alveolary arch was thus detached, without any previous extraction of the correfponding teeth, three of which were removed by the fame ftroke. In this manner an opening was procured in the external and inferior part of the antrum, large enough to admit a walnut. Through this aperture a confiderable part of the tumour was cut away with a knife, curved fideways and fixed in its handle. A moft profufe hemorrhage took place, but Default, unalarmed, held a comprefs in the antrum for a fhort time; this being removed, the actual cautery was applied repeatedly to the reft of the fungus. The cavity was dreffed with lint, dipped in powdered colophony.

On the eighteenth day the fwelling was evidently diminifhed, the eye lefs prominent, and the epiphora lefs vifible. But at this period a portion of fungus made its appearance again. This was almoft entirely deftroyed by applying the actual cautery twice. It appeared again, however, on the twenty-fifth day, and required a third and laft recourfe to the cautery. From this time the progrefs of the cure went on rapidly. Inftead of fungous excrefcences, healthy granulations were now formed in the bottom of the finus. The parietes of the antrum gradually approaching each other, the large opening made in the operation was obliterated, and reduced to a fmall aperture, hardly large enough to admit a probe. Even this little opening was clofed in the fourth month, at which time no veftiges of the difeafe remained, except the lofs of teeth, and a very obvious depreffion juft where they were fituated. (Œuvres Chirurgicales de Default, par Bichat, tom. 2.)

Some readers may deem fome of the foregoing meafures rude and violent. The ftriking out of three of the teeth with a portion of the alveolar procefs, and the employment of the actual cautery, are undoubtedly very rough proceedings, and cannot be expected to receive the approbation of many furgeons in this country. Nor will we abfolutely declare in favour of thefe methods, much as we are convinced of the neceffity of having recourfe to powerful means, and greatly as we admire the boldnefs and decifion which guided the hand of Default. We confider the ufe of the perforator and falciform knife, however, deferving of recommendation. In fome inftances a fmall trephine might be ufed for making an opening into the antrum. Even the removal of a part of the alveolar arch muft be effected if the root of the excrefcence cannot otherwife be reached. Perhaps one of the faws, defcribed and engraved in Mr. Hey's Practical Obfervations in Surgery, might be the beft inftrument for accomplifhing this object; but rather than that the purpofe fhould not be fulfilled, if a fufficient expofure of the fungus cannot otherwife be obtained, we confider even Default's plan indifpenfably proper, on account of the terrible and fatal mifchief which muft inevitably follow the continuance of the difeafe. With regard to the employment of the actual cautery, furgeons may eafily avoid the difagreeable duty of applying hot irons, by ufing, inftead of fuch barbarous implements, the kali purum, with or without the calx viva. After cutting away as much of the fungus as poffible, the furface from which its root arofe fhould be freely rubbed with the cauftic, fo as to obviate the danger of the excrefcence growing again. If, however, any fungous granulations fhould re-appear, the furgeon muft take care to extirpate them immediately with the knife and cauftic. In all probability fuch fteps will kill a portion of the bone; but who would not rather fubmit to the tedioufnefs of an exfoliation than to the re-production of a terrible difeafe, which is equally loathfome, deforming, and painful, holds forth no chance of fpontaneous amendment, and tends to a fhocking fpecies of death?

Fungus Cerebri, or Hernia of the Brain.—This is a totally different difeafe from the excrefcences which fometimes grow from the dura mater, and make their way outward by producing an abforption of the fuperincumbent part of the fkull, and an ulceration of the integuments of the head. Such fungi, for the moft part, begin while the cranium is entire, and the deftruction of the bone is a confequence of the increafe of the fubjacent fwelling. On the other hand, the fungus, or hernia cerebri, follows a removal or deftruction of a piece of the fkull, and confequently, when the difeafe occurs, it is almoft always after the operation of trepanning, though, if Mr. Charles Bell's account be accurate, the fame kind of tumour may alfo be a confequence of a venereal caries of the cranium.

Mr. Abernethy has publifhed an interefting cafe, and offered the following theory of the formation of the difeafe; "In confequence of the brain being injured to fome depth beneath the furface, difeafe of the veffels, and confequent effufion of blood had enfued. The effufion was, for a time, reftrained by the fuperincumbent brain and its membranes; but thefe gradually yielding to the expanfive force exerted from within, and at laft giving way altogether, the fluid blood oozed out, and congealed upon the furface of the tumour." Hence Mr. Abernethy appears to fuppofe that the excrefcence is compofed of a mere mafs of congealed blood, and the rapidity with which the fwelling arofe in the cafe which he diffected made him think that there was not time enough for any organized vafcular fubftance to be formed.

However, we cannot help fufpecting that the fungus cerebri is vafcular, like other tumours, and when Mr. Abernethy mentions, in the relation of the example which he diffected, the irregularly *granulated* furface of the fwelling, we cannot conceive how fuch a ftructure could be an accidental confequence of a mere exudation of blood.

Mr. Charles Bell, in his Operative Surgery, vol. i. expreffes his opinion that the deficiency of the fkull, and the ulceration of the dura mater, always precede the growth of the fungus, that after large openings made in the cranium with the trepan, or the elevation of extenfive depreffed pieces of the fkull, the pulfation of the brain forces the dura mater againft the fharp edge of the bone, and makes that membrane ulcerate; and that then a fungus rapidly fprouts up from the fubftance of the brain, which has a tendency to ulceration.

In proof of the vafcularity of the fungus, feveral circumftances are mentioned by the foregoing writer. The tumour bleeds when torn or cut. It fhrinks and collapfes when the patient dies. Mr. Charles Bell has a preparation of the difeafe, where an ulcer paffes from its bafe into the lateral ventricle, and where the ulcer has an external opening, yet no blood, nor coagulum, was found upon the furface of the brain, or in the cavities. The fwelling is not formed of concentric laminæ, like the coagulum of an aneurifm. The blood never burfts from its furface as it would do even from a venous tumour, which could in the firft inftance make its way through the membranes of the brain. It is affected, like fpongy granulations, by cauftic. A degree of compreffion, fuch as would ftop bleeding from a confiderable artery, will not fubdue the difeafe when it has made fome progrefs. The fwelling has a fibrous ftructure, and when diffolved after death, hangs in fhreds, not like a coagulum.

In a cafe of fungus cerebri, which fell under Mr. Charles Bell's obfervation, and arofe after a venereal exfoliation of the

the ſkull, the following ſymptoms occurred: At the beginning, while ſenſibility laſted, the patient uſed to have cold ſhiverings and pain in the head. His countenance was of a pale, dirty, cadaverous yellow. As the tumour increaſed, he had frequent ſickneſs, was ſubject to giddineſs, and reeled like a drunken man; the pulſe became ſlow and weak; he betook himſelf entirely to his bed, could no longer ſit up, became incoherent, lay oppreſſed, and had a pulſe which was a mere tremulous motion of the artery. The diſeaſe ran its courſe in about eight days.

With regard to the treatment of the fungus cerebri, Mr. Abernethy is of opinion, that when no bad ſymptoms precede the appearance of the tumour, or when they go away upon the ſwelling being freed from the confinement of the dura mater, it may perhaps be moſt prudent not to interfere with the diſeaſe. The tumour may of itſelf drop off in pieces, and be no more renewed. In the Edinburgh Medical Commentaries, vol. i. p. 98, may be found a caſe, in which the tumour continued to increaſe for fourteen days, and had become as large as a gooſe's egg, when it dropped off in largiſh pieces. Another inſtance of the ſame kind is alſo recorded in the Medical Muſeum, vol. iv. p. 463. See likewiſe Fabricius Hildanus.

While the tumour is unattended with any urgent ſymptoms, it only ſeems neceſſary to cover the ſwelling and ſore with ſome mild dreſſing, carefully avoiding all preſſure, which both reaſon and experience ſhew is likely to be attended with bad conſequences.

However, if the fungus ſhould continue to increaſe very much, ſo as to make it almoſt impoſſible to avoid making preſſure upon it, the plan, which experience appears to approve the moſt, is occaſionally to pare off the tumour with a knife.

That ſuch ſwellings may be ſucceſsfully removed has been proved both by accidents and by practice. Du Queſnay, in the Mémoires de l'Academie de Chirurgie, relates the following caſe: A young man received, on the right parietal bone, a blow which cauſed a fracture. A part of the bone was taken away, and a hernia cerebri enſued, which was ſeveral times pared down with a knife. On the thirty-fifth day from the accident, the patient, in a ſtate of intoxication, put his hand under the dreſſings, and tore the protruding portion of the tumour violently away. The next day the ſurgeon found that almoſt the whole of what he conſidered as corrupted brain was removed, ſo deep a cavity being left, that the corpus calloſum could almoſt be ſeen. The place healed up completely; but a palſy of the left ſide of the body, which had come on the day after the accident, ſtill continued.

Several examples are recorded by Mr. Hill of fungi of the brain being ſucceſsfully pared down with a knife. (See Caſes in Surgery).

When a fungus cerebri, in conſequence of being confined by the ſmallneſs of the aperture in the bone, occaſions irritation and preſſure on the brain, it may be adviſable to enlarge the opening in the cranium. In this way, the ſurgeon may alſo ſucceed in giving vent to fluid collected and confined under the ſkull.

There are ſome caſes to be met with, in ſurgical books, greatly againſt the employment of compreſſion. One is noticed by Scultetus, in his Armamentarium Chirurgicum, obſ. 19; and another in the London Medical Journal, vol. x. p. 277. In theſe inſtances compreſſion was tried, for the purpoſe of ſtopping the growth of the tumour; but both the patients died. Upon diſſection, a large cavity was found in each brain, filled with an accumulation of fluid, which had been prevented from eſcaping, by reaſon of the opening in the bone being cloſed by the fungus.

Were a caſe to preſent itſelf, in which the degree of hemorrhage from a fungus cerebri was dangerous, Mr. Abernethy has propoſed the plan of removing the ſubſtance of the ſwelling, and expoſing the bleeding veſſels, in order to ſee whether this expoſure would put a ſtop to the bleeding. This gentleman conſiders the experiment juſtified by analogy; for bleeding in other ſituations will often continue notwithſtanding the preſſure of the dreſſings and large coagula; but will immediately ceaſe on the bleeding ſurface being expoſed.

We ſhall conclude with cautioning ſurgeons againſt the danger of ever applying ſtyptics and cauſtics to any diſeaſes ariſing from the ſurface, or ſubſtance of the brain, and with adviſing them not to let the fungus draw away their attention from every other circumſtance. Frequently, inflammation of the pia mater will be co-exiſtent with the latter diſeaſe, and require at leaſt as much vigilance, deciſion, and judgment on the part of the ſurgeon.

Fungus Teſtis.—Until lately, the particular diſeaſe of which we are about to ſpeak ſeems to have eſcaped the notice of ſurgical writers, and in conſequence of the affection not being underſtood, when met with in practice, the ſevere proceeding of caſtration has too often been very unneceſſarily adopted.

An exceedingly able deſcription of the fungus teſtis was publiſhed by Mr. Lawrence in the fourth volume of the Edinburgh Medical and Surgical Journal. The ſubject is there illuſtrated with the particulars of nine caſes, which fell under the author's obſervation.

It is ſtated by this gentleman, that the patient commonly aſſigns ſome blow, or other injury, as the cauſe of the complaint. In ſome inſtances, the diſeaſe originates in the hernia humoralis from gonorrhœa; in others it comes on without any apparent cauſe. The diſorder begins with an extremely hard painful ſwelling of the teſticle. After a certain ſpace of time the ſcrotum ulcerates; but the opening which is thus formed, inſtead of diſcharging matter, gives iſſue to a firm and generally inſenſible fungus. The ſurrounding integuments and cellular ſubſtance are thickened and indurated by the complaint, ſo that there appears altogether a conſiderable maſs of diſeaſe. As ſoon as the ſcrotum has burſt, a conſiderable diminution of the pain and ſwelling takes place. In this ſtate the diſorder appears very indolent; but if the fungus be deſtroyed by any means, the integuments come together, and a cicatrix enſues, which is inſeparably connected with the teſticle.

Mr. Lawrence next informs us, that an examination of the part, while the fungus exiſts, diſcloſes the fact, that this growth has its origin in the glandular ſubſtance of the teſtis itſelf; that the coats of the part are deſtroyed to a certain extent; and that a protruſion of the tubuli ſeminiferi takes place through the opening, which is thus formed. "I have often (ſays this gentleman) aſcertained the continuity of the excreſcences with the pulpy ſubſtance of the teſtis, of which we ſhall find more or leſs remaining, according to the difference in the period of the diſorder. It appears to me that the glandular part of the teſtis experiences an inflammatory affection in the firſt inſtance, in conſequence of the violence inflicted on it; and that the confinement of the ſwollen ſubſtance, by the denſe and unyielding tunica albuginea, ſufficiently explains the peculiar hardneſs of the tumour, and the pain which is always attendant on this ſtage of the diſorder. The abſorption of the coats of the teſtis and of the ſcrotum obviates the tenſion of the parts, and thereby reſtores eaſe to the patient, at the ſame time that the fungus makes its appear-

appearance externally. I think it not improbale, that if the complaint were left entirely to itfelf, the fwelling would fubfide, the fungus fhrink, and a complete cure enfue, without any profeffional affiftance; but the diforder is fo indolent in this ftage, that a fpontaneous cure would not be effected until after a very long time. The excrefcence may, however, be removed by the knife, or, if the nature of its attachment permit, by ligature; or it may be freely treated with efcharotic applications. The removal of the protuberance to a level with the fcrotum, by means of the knife, is the fhorteft and moft effectual mode of treatment. I can fee no ground whatever for propofing caftration in this malady, fince in no part of its progrefs, nor in any of its poffible confequences or effects, can it expofe the patient to the flighteft rifk. Some may be difpofed to defend the removal of the part, becaufe it would bring the cafe to a more fpeedy termination, and if a patient, after being informed of all the circumftances, fhould defire the operation on this ground, the furgeon would be juftified in performing it. But I think he never could be warranted in propofing fo painful and dangerous a remedy as caftration, for a diforder attended with neither pain nor danger, and admitting of cure by a perfectly fafe and mild kind of treatment.

"Fungufes of a different character and progrefs may, no doubt, occur in the teftis; but the defcription already given will ferve to difcriminate that particular fpecies, to which alone the prefent obfervations are defigned to apply. In a cafe, in which my friend Mr. Macartney performed the operation of caftration, the teftis itfelf was found, and the fungus, which was a firm and denfe fubftance, grew from the tunica albuginea."

Mr. Lawrence proceeds to mention, that fome authors have recorded cafes which bear a flight analogy to the fungus teftis, of which we have been fpeaking. Petit and Swediaur are ftated to have defcribed the difcharge of fmall portions of the fubftance of the tefticle from an abfcefs of the part. (See Mem. fur la Suppuration de la Membrane propre de Tefticule in Mem. de l'Acad. de Chirurgie, tom. 4. and Obfervations on Venereal Complaints.) Bertrandi defcribes the fame occurrence, and the fubfidence of a protruded part under the ufe of ftimulant powders. (See Mem. de l'Acad. de Chirurgie, tom. 5. p. 677.) Sabatier mentions the fwelling and burfting of the tefticle, and efcape of a part of its fubftance, as occafionally occurring in the radical cure of the hydrocele. (Mem. de l'Acad. de Chirurgie, tom. 3.)

The cafes of the fungus teftis, publifhed by Mr. Lawrence, are well deferving of attention, as they afford a very fatisfactory explanation of the nature of the difeafe. The performance of caftration for the cure of this malady ought, in our opinion, never to be thought of. Even when the patient himfelf has had the nature of the cafe explained to him, and wifhes to fubmit to the operation with a view of getting fpeedily well, we confider that the removal of the teftis is not at all neceffary in the cure, and that were this fevere method adopted, it would not be the moft expeditious means of relief. Cutting away the prominent part of the fungus, and freely rubbing the deeper portion of it with cauftic, will certainly deftroy the diftemper, and, after this practice, we fhall have no extenfive wound of the fcrotum to heal up, as would be the cafe were caftration performed. Hence it appears to us, that the removal of the tefticle is warranted by no confiderations whatever, not even by the earneft intreaties of the patient. Such a wifh can only arife from not knowing that the difeafe may be got rid of, with at leaft equal quicknefs, by a much milder plan of treatment. We fhall take our leave of this fubject with referring our readers to the cafes recorded by Mr. Lawrence. (See Edinburgh Medical and Surgical Journal, vol. iv. p. 257.)

Fungus Hæmatodes.—This is one of the moft intractable difeafes to which the human frame is liable. Terrible as the diftemper is, however, it was not confidered as a cafe of a diftinct and peculiar nature, until Mr. Burns, of Glafgow, gave fome account of the fubject in the fecond volume of his work on inflammation. The diforder is there defcribed under the name of *fpongoid inflammation*, and, at prefent, it is known by fome other appellations, fuch as the *foft cancer*, *medullary farcoma*, and *carcinome fanglante*.

Before Mr. Burns publifhed the above-mentioned book, the fungus hæmatodes was always miftaken for cancer, and we may indeed ftate, that the fame error generally continued to prevail, until Mr. Hey's "Practical Obfervations in Surgery" iffued from the prefs in the year 1803. How different the two difeafes are, will be clearly fhewn in the fequel of the prefent article.

The fungus hæmatodes has moft frequently been obferved to make its attack on the eye-ball, the upper and lower extremities, the tefticle, and the mamma. Mr. Wardrop ftates, that the uterus, ovary, liver, fpleen, lungs, and thyroid gland, have alfo been the feats of the difeafe, and Mr. Burns has recorded one example, in which the hip-joint was the part affected. The joint of the fhoulder likewife appears to be fubject to the malady, as is proved by fome drawings in the collection of the École de Médecine, fhewing fpecimens of what the French have named the "carcinome fanglante", which is plainly the fame affection as the fungus hæmatodes.

A diftemper, which makes its attack on fo many different parts and organs, cannot always prefent itfelf exactly in the fame form. Hence, it feems expedient to offer a concife account of the manner in which the malady occurs in various fituations, more particularly the eye, extremities, female breaft, and tefticle.

According to Mr. Wardrop, the firft appearances of the fungus hæmatodes, when it attacks the eye, are in the pofterior chamber. The pupil becomes dilated and immoveable, and, inftead of having its natural deep black colour, it has a dark amber, and, in fome cafes, a greenifh hue, giving to the eye much of that appearance which exifts in the found eye of a fheep or cat. As the difeafe advances, the colour becomes more remarkable, and, at length, is difcovered to be occafioned by a folid fubftance, proceeding from the bottom of the eye towards the cornea. The furface of this fubftance is generally rugged and unequal, and, in fome cafes, red veffels may be feen running acrofs it. Thefe are ramifications of the central artery of the retina, fituated in front of the opaque body. In proportion as the difeafe makes progrefs, the new-formed fubftance gradually fills up the whole of the pofterior chamber, and its furface advances as far forward as the iris. In this ftate, the difeafe has the appearance of an amber, or a brown mafs, and, in two inftances, which Mr. Wardrop was acquainted with, the exiftence of cataracts was fufpected, and couching in one example actually undertaken by an experienced furgeon.

The difeafe continuing to increafe, an alteration next takes place in the fhape of the eye-ball, which acquires an irregular knobbed appearance. At the fame time the fclerotic coat lofes its natural pearly-white colour, and becomes of a dark blue, or livid hue. The tumour now occupies the whole anterior chamber, and, in fome cafes, a quantity of purulent matter collects between the difeafed mafs and the

the cornea. At laſt, the cornea ulcerates, and a fungous tumour ſhoots out. In certain inſtances, the ſwelling makes its way through the ſclerotic coat.

Mr. Wardrop notices, that the fungus to which we have juſt now adverted is very rapid in its growth, and often acquires a conſiderable bulk. When ſmall, it bears a near reſemblance to a ſoft polypus. It is generally of a dark red, or purple colour. Its ſurface is irregular and often covered with coagulated blood. Its ſubſtance is eaſily torn, and on being broken, or ſlightly ſcratched, a profuſe hemorrhage takes place. In particular caſes, the fungus is of a firmer texture. When the ſwelling happens to protrude through the ſclerotic coat, it receives a covering from the tunica conjunctiva. When the fungus has attained a large ſize, the moſt prominent parts ſlough away, attended with a very fœtid ſmell, and a diſcharge of acrid ſanies.

In the courſe of the diſeaſe the lymphatic glands become affected, particularly thoſe which lie about the parotid gland, and under the lower jaw.

When an eye, affected with the fungus hæmatodes, in an advanced ſtate, is diſſected, a diſeaſed maſs is found extending forwards from the entrance of the optic nerve in ſuch a manner as to have produced an abſorption of the vitreous, cryſtalline, and aqueous humours. The retina is, as it were, annihilated, while the choroid coat is propelled forward, and ſometimes quite deſtroyed.

The ſubſtance of the excreſcence itſelf has the appearance of medullary matter, being chiefly compoſed of an opaque, whitiſh, homogeneous matter, having the ſame pulpy ſoftneſs and tenacity which characterize brain. It varies, however, both in conſiſtence and colour in different caſes, and ſometimes contains bony particles.

The optic nerve is thicker and harder than natural, of a browniſh aſh-colour, and deſtitute of the tubular appearance which it ought to have. In other caſes, the nerve, beſides being altered in its ſtructure, is ſplit into one or more pieces, the morbid growth filling up the interſpaces, ſurrounding the different portions of the nerve, and forming one connected maſs with the contents of the eye-ball. Other changes have been remarked in the nerve; but they muſt be learnt by a reference to Mr. Wardrop's publication.

The brain and its membranes have alſo been obſerved to ſhare the diſeaſe. Dark red ſpots have been noticed on the dura mater, and, in other examples, white ſpots were found between the tunica arachnoides and pia mater, which were ſcattered almoſt all over the ſurface of the brain, and proved to be ſmall bags, containing a fluid like cream.

When the abſorbent glands are enlarged, they are found converted into the ſame kind of medullary matter, which compoſes the diſeaſed maſs in the eye-ball. Should the ſkin burſt, a ſloughy ulcer is produced; but, according to Mr. Wardrop, no fungus ſhoots out, unleſs when the affection of a lymphatic gland is itſelf a primary one.

In conſidering the fungus hæmatodes of the eye, every reader muſt be ſtruck with the very early period of life at which the diſeaſe generally commences. Of twenty-four caſes with which Mr. Wardrop has been acquainted, twenty were under twelve years of age, and it is ſtated, in "Les Œuvres Chirurgicales de Deſault, par Bichat," tom. 2, that two-thirds of the patients, on whom Deſault operated for carcinoma of the eye, at the Hotel-Dieu, were under twelve years of age. Now as cancer is always moſt diſpoſed to attack perſons advanced in life, we may conclude, that Deſault's patients, for the moſt part, laboured under the fungus hæmatodes, from which, indeed, cancer has not been diſcriminated by moſt of the beſt ſurgical writers.

The ſight of young ſubjects is generally deſtroyed before the attention of parents is excited to the diſtemper. In many caſes, however, the eye firſt receives a blow, which brings on inflammation, and after the ophthalmy has laſted a certain time, the coloured ſubſtance becomes perceptible at the bottom of the eye. When no external violence has occurred, the firſt ſymptom is a trivial fulneſs of the veſſels of the conjunctiva, the iris becoming, at the ſame time, extremely vaſcular, and altered in colour, and the pupil dilated and immoveable. There is ſeldom much complaint made of pain; but the child is ſometimes obſerved to be languid and feveriſh.

In adults, the fungus hæmatodes of the eye generally comes on without any apparent cauſe, though ſometimes in conſequence of a blow. At firſt, the tunica conjunctiva is ſlightly reddened, and viſion is indiſtinct. The redneſs and obſcurity of ſight increaſe ſlowly, and an aching pain is experienced in the head. The latter ſymptom is deſcribed as being moſt agonizing, particularly during the night, and never becoming diminiſhed, until the eye burſts and the humours are diſcharged. Only one eye is in general affected.

With regard to the cure of the fungus hæmatodes of the eye, the only chance of effecting this deſirable object depends upon the early extirpation of the diſeaſed organ. It muſt be acknowledged, however, that moſt of the operations, in which the morbid eye has been removed, have hitherto proved unſucceſsful, owing to a recurrence of the diſeaſe. The reaſon of this circumſtance may be imputed to the optic nerve being almoſt always in a morbid ſtate, before any attempt is made to remove the eye. Mr. Wardrop remarks, that paſt experience proves the impropriety of attempting any operation, when the diſeaſe has advanced ſo far that the poſterior chamber is filled with the diſeaſed growth. Since no internal medicines, nor external applications, ſeem to afford the leaſt hope of checking any form of the fungus hæmatodes, it is obvious, that when the diſeaſe of the eye has exceeded certain bounds, the miſerable patient is placed beyond the reach of any effectual aid from ſurgery.

We ſhall conclude our remarks on fungus hæmatodes of the eye, with referring the reader to a late valuable publication, entitled "Obſervations on Fungus Hæmatodes," by James Wardrop, 1809. In this book many caſes, and numerous particulars, relative to the morbid anatomy of the diſeaſe, are ably deſcribed.

When fungus hæmatodes affects any part of the limbs, the diſeaſe generally commences with a ſmall colourleſs tumour, which, if there be no thick covering over it, ſuch as the faſcia of a muſcle, or the aponeuroſis of the foot, is ſoft and elaſtic, but in other caſes tenſe. It is at firſt free from uneaſineſs; but by degrees a ſharp acute pain darts occaſionally through it, more and more frequently, until the ſuffering is inceſſant. For a conſiderable time the tumour is ſmooth and even; but afterwards it projects irregularly in one or more points, and the ſkin at this place becomes of a livid red colour, and feels thinner than elſewhere. It here readily yields to preſſure, but inſtantly bounds up again. Small openings now form in theſe projections, and diſcharge a thin bloody matter. Almoſt immediately after theſe tumours burſt, a ſmall fungus protrudes, like a papilla, rapidly increaſes both in breadth and height, aſſumes the appearance of a carcinomatous fungus, and often bleeds in a very profuſe manner. The matter is thin, and exceedingly fœtid, and the pain is ſaid to be of the ſmarting kind. The integuments

integuments are red and tender for ſome extent round the ulcers. After ulceration has taken place, the neighbouring glands ſwell, and put on exactly the ſpongy qualities of the primary tumour. If the patient ſtill furvive this advanced ſtate of the diſtemper, ſimilar tumours form in other parts of the body, and the patient dies hectic. (Diſſertations on Inflammation, vol. ii. p. 303.)

According to a late practical writer, when the diſeaſe is limited to the adipoſe, or cellular membrane, which covers the muſcles, the tumour is not uſually painful in the beginning, nor does it impede the motion of the muſcles on which it is ſeated. But when the diſorder occupies a deeper ſituation in the limbs, pain and weakneſs of the affected parts are felt. The fungus, alſo, as it increaſes in bulk, does not render the integuments uniformly thin, as in the caſe of an abſceſs. In one part the tumour, when preſſed with the hands, will afford the ſenſation of a deep-ſeated fluid, while another part will feel hard and uneven. Mr. Hey differs a little from Mr. Burns, in ſtating that the ſkin does not become uniformly thin and of a red colour, as when purulent matter is making its way to the ſurface of the body; but, on the contrary, that the integuments continue to feel as thick as uſual round the fungus, which protrudes through them. (Practical Obſervations in Surgery, p. 283, 284).

Fungus hæmatodes is ſeen on the extremities in ſubjects of every age, although, as we have already explained, the ſame affection of the eye-ball is commonly met with in children under the age of twelve.

Sometimes the tumour has ſucceeded ſome external violence, and conſequently, at firſt, has not been diſtinguiſhable from the common ſwelling of the injured parts.

It is the nature of the tumour to grow in the commencement by ſlow degrees; but as ſoon as an opening is made, the fungus generally ſhoots up with aſtoniſhing quickneſs.

The tumour, before ulceration occurs, often preſents ſo deceitful a ſenſe of fluctuation as to induce very experienced ſurgeons to believe that the caſe is a collection of fluid, and, of courſe, to make a puncture with a lancet. This proceeding ſhould always be carefully avoided, ſince it never fails to aggravate the diſeaſe, and accelerate the patient's diſſolution.

The fungus which ariſes on the extremities is generally of a round form, has an unequal rugged ſurface, and clotted blood is frequently ſeen adhering to it. It is of a dark red colour, is eaſily torn, and bleeds on being touched even in a gentle way. Its neck is commonly very narrow, while the upper portion ſpreads out very much, ſo as completely to cover the edge of the ulcerated ſkin.

When the fungus has attained a large ſize, the moſt prominent portions ſlough away, attended with an exceedingly fœtid diſcharge, and conſiderable hemorrhage.

Sometimes the abſorbent glands become contaminated with the diſeaſe, while the ſwelling is yet ſmall, in other caſes not till it ulcerates. The glands between the tumour and the thoracic duct are thoſe which are liable to be affected, ſo that, when the fungus hæmatodes is on the lower extremity, the glands in the groin, and all thoſe in the courſe of the iliac veſſels and aorta, are apt to be diſeaſed.

When a fungus hæmatodes, ſituated on one of the limbs, is examined after death or amputation, the tumour itſelf is found to conſiſt of a ſoft ſubſtance, ſomewhat like the brain, of a greyiſh colour and greaſy appearance, with thin membranous-looking diviſions running through it, and cells or abſceſſes in different places, containing a thin bloody matter, occaſionally in very conſiderable quantity. There does not ſeem uniformly to be an entire cyſt ſurrounding the tumour; for the ſwelling very frequently dives down betwixt the muſcles, or down to the bone, to which it often appears to adhere. The neighbouring muſcles are of a pale colour, and loſe their fibrous appearance, becoming more like liver than muſcle. The bones in the vicinity of the tumour are always carious. (See Burns on Inflammation, vol. ii. p. 305.)

When the parts containing the fungus are divided, they are found to be in a morbid ſtate. The adipoſe membrane forms a great number of pouches, filled with the fungus, upon the removal of which the pouches, if the patient be alive, bleed profuſely from every part of their internal ſurface. (Hey's Practical Obſervations in Surgery, p. 284.)

We have remarked, that in fungus hæmatodes of the eye other parts of the body were often affected with the diſeaſe before the patient's death. So when the extremities are the ſeat of the diſtemper, the lymphatic glands in the courſe of abſorption are apt to become diſeaſed, and not only theſe parts are ſometimes found in a morbid ſtate, but even the brain, the kidney, the liver, the breaſt, and other viſcera, as ſeveral well-authenticated caſes have now indiſputably proved. The reader may, if he pleaſe, be convinced of this important fact by referring to ſome of the examples which are detailed in Mr. Wardrop's late publication.

We have ſtated, that Mr. Burns of Glaſgow firſt wrote upon the fungus hæmatodes, as a diſtinct and peculiar diſeaſe, under the name of "ſpongoid inflammation." There are, however, numerous caſes of the diſeaſe recorded in ſurgical books by authors who were unacquainted with the general character of the complaint. See "An account of an anomalous tumour of the leg unſucceſsfully treated," publiſhed in Monro's works. Likewiſe the deſcription, which Mr. Pott has given, of a peculiar ſwelling of the calf of the leg, in his remarks on amputation.

On the ſubject of the treatment of fungus hæmatodes, ſituated on the extremities, we need not long detain the reader. When he hears that no internal medicine, nor external application, ſeems to have the leaſt power of checking this malignant diſeaſe, he will naturally turn his mind to the plan of extirpation with the knife. Mr. Hey informs us, that the growth of the fungus cannot always be repreſſed by the ſtrongeſt eſcharotics. Neither the hydrargyrus nitratus ruber, the hydrargyrus muriatus, the antimonium muriatum, nor the undiluted vitriolic acid, has been ſufficient for this purpoſe, and ſurgeons may always be certain, that when they irritate any malignant diſeaſe by plans which fail in accompliſhing its extirpation, they inevitably accelerate the expanſion of the morbid ravages, and haſten the patient's death.

The fungus hæmatodes is one of thoſe terrible maladies with which no wiſe ſurgeon will dare to tamper. As ſoon as the nature of the caſe is aſcertained, the whole of the diſeaſed ſubſtance, and parts in its vicinity, ſhould be carefully cut away. We are of opinion, that if this plan be ſtrictly executed, the patient will have as much chance of recovery, as if the limb were amputated. It is our duty, however, to ſtate, that in all the caſes in which the tumour alone was extirpated by Monro, Burns, and Hey, the diſeaſe recurred. Hence, Mr. Wardrop thinks, that we are warranted in urging the removal of the whole limb, as ſoon as the true nature of the caſe is manifeſt. When therefore any tumour is ſuſpected of being a fungus hæmatodes, the latter gentleman ſuggeſts the plan of making an opening into the ſwelling, for the purpoſe of ſeeing its ſtructure, and thus forming a deciſive judgment. If the caſe prove to be fungus hæmatodes, the limb might be immediately

mediately removed; if not, the ſurgeon might be content with putting in practice whatever meaſures the particular nature of the caſe ſhould require.

There are a few circumſtances which are quite manifeſt after the foregoing account. Firſt, that if an attempt be made to cut away the tumour, and ſave the limb, the ſurgeon muſt take care to remove at the ſame time a conſiderable quantity of the ſoft parts in the circumference of the ſwelling. Secondly, that after the tumour is taken out, a careful examination of the ſurface of the wound ſhould be made, and every ſuſpicious part or fibre cut away. Thirdly, that ſhould the diſeaſe, notwithſtanding ſuch caution recur, amputation ſhould be performed without delay. Fourthly, that cauſtics ſhould never be employed in theſe caſes. Laſtly, that as other inviſible parts and viſcera are often diſeaſed at the time when the operation is done, the ſurgeon ſhould always be upon his guard, and not raiſe the hopes of the patient's friends too high. Were he to act otherwiſe, reproach and loſs of reputation would be the frequent conſequences of his conduct.

The teſticle is liable to the fungus hæmatodes, and the affection was firſt deſcribed by Dr. Baillie, in his Morbid Anatomy, under the name of the *pulpy teſticle*. Mr. Abernethy, in his publication on tumours, has given an account of what he terms *medullary ſarcoma*, and of a remarkable inſtance, in which the foregoing part was attacked. It is ſuppoſed, that the medullary ſarcoma of Mr. Abernethy is, in reality, the ſame as the fungus hæmatodes of Hey, Wardrop, and other writers. The caſe to which we have alluded being very illuſtrative of the nature of this diſeaſe in the teſticle, we conceive that the reader will not regret its inſertion in the preſent article.

" A tall, thin, healthy-looking man, of about forty years of age, had, about fifteen years before, a ſwelled teſticle from a gonorrhœa; the epididymis remained indurated. Six years afterwards it became enlarged, and a hydrocele at the ſame time formed. Half a pint of water was diſcharged by a puncture, but inflammation ſucceeded the operation, and this teſtis became very large. An abſceſs formed, and burſt in the front of the ſcrotum, and the teſtis ſubſided in ſome degree. Mercury was employed to reduce it, but without effect. The part, however, was indolent, and gave the patient no trouble but from its bulk.

" About a year afterwards, a gland enlarged in the left groin (the ſame ſide as the teſtis): another then became ſwoln in the right groin, and, in the courſe of two years, ſeveral glands in each groin had obtained a very conſiderable magnitude. At this period, he was admitted into St. Bartholomew's Hoſpital under the care of Mr. Long. The teſtis was, at this time, between four or five inches in length, and about three in breadth; it reſembled its natural form, and was indolent in its diſpoſition. The ſpermatic chord was thickened, but not much indurated. Four or five glands were enlarged in the groin on both ſides; each of which was of the ſize of a very large orange; and, when obſerved together, they formed a tumour of very uncommon ſhape and magnitude.

" They gradually increaſed in ſize for ſeveral months, till at laſt the ſkin appeared as if unable to contain them any longer. It became thin, inflamed, and ulcerated, firſt in the left groin, and thus expoſed one of the moſt prominent tumours. The expoſed tumour inflamed and ſloughed progreſſively, till it entirely came away. As the ſloughing expoſed its veſſels, which were large, they bled profuſely, inſomuch that the ſtudents endeavoured, but in vain, to ſecure them by ligatures; for the ſubſtance of the tumour was cut through, and torn away in the attempt. Preſſure by the finger, continued for ſome time, was the only effectual mode of reſtraining this hemorrhage.

" The loſs of one gland relieved the diſtended ſkin, which had only ulcerated on the moſt prominent part of the tumour, and had not become diſeaſed. It now loſt its inflamed aſpect: granulations formed, and a cicatrix took place. In the oppoſite groin a ſimilar occurrence happened. One gland, expoſed by the ulceration of the ſkin, ſloughed out, being attended by the circumſtances juſt recited. However, before the ſkin was cicatrized, ulceration had again taken place in the right groin, in conſequence of the great diſtenſion of the ſkin from the growth of the tumour; and ſloughing had begun in the tumour, when the patient, whoſe vital powers had long been greatly exhauſted, died." See Surgical Obſervations, &c. 1804, by J. Abernethy, F. R. S. &c.)

In this example, the diſeaſe extended to many parts beſides the teſtis. The tumour, formed by the inguinal glands on each ſide, was as large as a man's head, and ſimilar in ſtructure to the diſeaſed teſticle. The pelvis was almoſt filled with ſimilarly diſeaſed glands, and the vertebræ were hidden by others as high up as the diaphragm. Some of them, upon being cut into, diſcharged a thick fluid reſembling cream.

Fungus hæmatodes of the teſticle is ſaid to begin, ſometimes in the body of that organ, ſometimes in the epididymis. The progreſs of the diſeaſe is ſlow, and the pain attending it is, in general, not great enough to excite alarm. Nor is there, at firſt, any inequality or hardneſs in the gland, nor change in the ſcrotum. When the teſticle has become exceedingly large, it feels remarkably ſoft and elaſtic, and as if it contained a fluid. Hence, the caſe has often been miſtaken for a hydrocele, and a puncture made with a trocar. Sometimes the tumour, when large, is in ſome places hard; in others ſoft. The hydrocele may be known by the water beginning to collect at the bottom of the ſcrotum, and then aſcending towards the ſpermatic cord, and by the ſwelling being circumſcribed towards the abdominal ring; whereas, in the fungus hæmatodes, the diſeaſe begins with a gradual enlargement of the teſticle itſelf, followed by a fullneſs, which extends up the ſpermatic cord. See Wardrop, p. 127.

It appears that the fungus hæmatodes in the teſticle does not claim this appellation, ſince, how large ſoever the tumour may be, it emits no fungous growth. Abſceſſes form, and the integuments of the ſcrotum burſt; but no fungus ſhoots out.

The teſtis is ſaid to be more frequently affected with the malady in young, than old perſons.

On diſſection, the ſubſtance of the diſeaſed teſticle is found to preſent a medullary, or pulpy appearance, generally of a pale browniſh colour, but ſometimes of a red. The conſiſtence is ſometimes uniform; ſometimes variegated, and interſected by thin membranes. When immerſed in water, a good deal of the medullary matter mixes with the fluid. In moſt caſes, the tunica albuginea and tunica vaginalis are adherent together: ſometimes there is a fluid between them. See Wardrop, 131—133.

With regard to the treatment, we have nothing to recommend, except caſtration, which, unleſs performed at an early period, before the diſeaſe extends up the cord, and to the lymphatic glands, muſt be unavailing. We fear, alſo, that the little alarm excited at firſt, and the difficulty of aſcertaining the early exiſtence of the diſeaſe, will always be ſtrong reaſons why few patients will ever be adviſed, or willing, to ſubmit to a timely operation. Its

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refult, likewife, even when done early, muft always be very uncertain, fince moft of the attempts to extirpate fungus hæmatodes in other fituations have for the moft part proved unfuccefsful, in confequence of the difeafe recurring in a more malignant and fatal form.

Mr. Hey, in his "Practical Obfervations in Surgery," has related feveral cafes in which the female breaft is ftated to have been the feat of the fungus hæmatodes. Mr. Wardrop has expreffed doubts about the reality of the diftemper in the inftances adduced by the foregoing writer. However, we are inclined to think, that the difeafe was fungus hæmatodes, fomewhat diverfified from the common character of the complaint, by reafon of the difference of ftructure in which it was fituated. Thus, in the tefticle, the diftemper has its peculiarities, fince, in this organ, when the integuments burft, no fungus fhoots out; and yet Mr. Wardrop does not hefitate to admit fuch difeafe to be the formidable diforder of which we have now been treating.

The following are fome of the moft remarkable circumftances which occurred in one example recorded by Mr. Hey. In making an exertion, a maiden lady, aged 54, felt fomething crack in her breaft. A few days afterwards, a fmall tumour, about the fize of a hazel-nut, took place in the part. The fwelling got gradually larger, was hard, and moveable. At length, it extended nearly to the axilla on one fide, and the fternum on the other. Its furface was uneven, and the integuments were in fome places thick. At other parts they were thin, and felt as if a fluid were under them. When the harder parts were handled, Mr. Hey had a fenfation as if he had broken fome fibrous fubftance. Shooting pains had been felt in the tumour from its commencement.

The fkin at laft gave way; a dark-coloured fubftance arofe in the fiffure; and blood began to ooze out of the opening. This aperture afterwards became fo large, that much bleeding ufed to take place from it, whenever the hemorrhage was not ftopped by a coagulum.

Mr. Hey removed a large oval piece of the difeafed integuments, chiefly with a view of fuppreffing the bleeding, with ftyptics.

The fungous fubftance, making the greater part of the tumour, bore a refemblance to that of a fungus hæmatodes of the thigh, recorded by the fame writer, p. 233. The mafs, upon being broken, bled. It adhered ftrongly to the remaining part of the integuments, which formed a great number of irregular cells. Indeed, the whole internal furface of the fac containing the fungus was compofed of thefe cells, except the bottom, which was formed by the pectoral mufcle, and was more even. In the operation, a difeafed portion of this mufcle, about two inches fquare, was left uncovered. It feemed as if it had been expofed to the air, and had begun to form granulations. The mufcular fibres were fcarcely diftinguifhable. The whole internal furface of the fac bled, as if the blood had been fqueezed from a fponge. Rufpini's ftyptic was applied with lint to the mufcle, and hot oil of turpentine to the reft of the cavity. The applications were kept on with a circular bandage.

The patient only lived till the morning of the day which followed the operation. It feems, that before fhe died a good deal of blood had been loft. See Practical Obfervations in Surgery, p. 254.

We need only add our own belief, that this cafe feems to merit the name of fungus hæmatodes, and that the only chance which the patient had of life depended upon the earlier attempt to cut away every particle of the difeafe. When this opportunity had paffed away, perhaps it might have been moft prudent not to have employed the knife at all, particularly as the only end of doing fo feems to have been that of applying very irritating ftyptic applications.

The reader is already apprifed, that the fungus hæmatodes has generally been confounded with carcinomatous affections. Hence, it feems proper, before taking our leave of this fubject, to notice the principal differences between cancer and fungus hæmatodes. This tafk feems yet neceffary; for, notwithftanding the two cafes may be eafily difcriminated by certain peculiarities, it is acknowledged, that in fome circumftances there exifts an analogy. Thus the progrefs of the two difeafes, efpecially in the early ftage, is generally flow. When ulceration happens, a thin fœtid ichor is difcharged, inftead of purulent matter, and, occafionally, both maladies are attended with profufe hemorrhages. Both difeafes often emit a fungus; both contaminate the lymphatic glands in the direction of the abforption; and both are apt to involve in the morbid ravages every kind of ftructure which may happen to be near. Laftly, both difeafes frequently affect at once feveral parts of the body. All thefe circumftances have been noticed by Mr. Wardrop.

The fame gentleman has explained, that a fchirrous tumour is, from its commencement, hard, firm, and incompreffible, and is compofed of two fubftances; one hardened and fibrous; the other foft and inorganic. The fibrous mattter is the moft abundant, confifting of fepta, which are paler than the foft fubftance between them. The foft matter is fometimes femi-tranfparent, and of a blueifh colour, differing fomewhat, however, in its appearances in different cafes.

A fchirrous tumour, fituated in the gland, is not capable of being feparated from the latter part, fo much are the two ftructures blended. A fcirrhus in another fituation fometimes condenfes the furrounding cellular fubftance, fo as to form a kind of capfule, and affume a circumfcribed appearance.

When a fcirrhous fwelling ulcerates, a thin ichor is difcharged, and a good deal of the hard fibrous fubftance is deftroyed by the ulceration, and the tumour is leffened. The difeafe continues to fpread by ulceration, other parts become affected, and the patient dies from the increafed quantity of morbid ravages and the irritation on the conftitution.

Sometimes, though not always, after a fcirrhus has ulcerated, it emits a fungus of a very hard texture. Such excrefcence, however, is itfelf at laft deftroyed by the ulceration. It is curious alfo, that cancerous fores often put on, for a fhort time, at a particular part, an appearance of cicatrization.

On the other hand, as Mr. Wardrop has remarked, the fungus hæmatodes, while of moderate fize, is a foft, claftic fwelling, with an equal furface, and a falfe feel of a fluctuation. It is in general quite circumfcribed, being contained in a perfect capfule. The fubftance of the tumour, inftead of being for the moft part hard, confifts of a foft, pulpy, medullary matter, which readily mixes with water. When ulceration occurs, the tumour is not leffened by this procefs, as in fcirrhus, but a fungus is emitted, and the whole fwelling feems to grow with increafed rapidity.

Finally, we fhall obferve, that cancerous difeafes are moft frequently met with in perfons who are confiderably advanced in life; that fungus hæmatodes generally afflicts young fubjects; and that the latter diftemper has been obferved in the liver, fpleen, kidney, and lungs, parts in which true cancer has never yet been remarked. Such readers as defire to be particularly acquainted with the fubject of fungus hæmatodes, may learn all that is yet known

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concerning this formidable disease, by referring to the second volume of some "Dissertations on Inflammation," by John Burns, (see page 302, on Spongoid Inflammation); and consulting Hey's "Practical Observations in Surgery," p. 233; Abernethy's "Surgical Observations," published 1804, p. 51; and, in particular, "Observations on Fungus Hæmatodes," by James Wardrop, printed 1809.

Fungus *Oculi*, in *Veterinary Science*, a name given by some of the writers on the diseases of horses to a distemper of the eye, to which that animal alone is subject. The first author who has communicated an observation of this disorder to the world is Dr. Lower, in the Philosophical Transactions. He observes, that horses alone are subject to it, and calls it a spungy excrescence of the uvea; it is commonly of a dark musk-colour, and grows out of the edge of the uvea, and though of little consequence in its first stages, yet if it grows very large, or if the number of the funguses increase, it weakens and obstructs the creature's sight, and sometimes wholly takes it away. The uvea is a muscular part, and its chief use is to dilate or contract itself in a proper manner for the admission of objects with as much light as the eye can bear, so that the brighter the light is to which the eye is exposed, the more this membrane is contracted into a narrow compass, and the more dark the place is, the more the opening is dilated. This sudden change, and the office of this part, may be more conveniently seen in the eye of a cat, than in that of any other animal, but it is the same in all, in a greater or less degree. If the edge of this coat be loaded with a very large excrescence of this kind, or if several, though smaller, grow all round it, it must necessarily happen, that the pupil, or sight, is very much if not totally obstructed, and the animal sees very little, or not at all. The horses of this kind are very ill furnished for seeing in the sunshine, but do very well in dark days, or in the dusk of the morning or evening, when the disease is not too violent. It is observable, that when these funguses grow in the eyes of young horses, they become much smaller when they are taken to dry meat in the stable, and increase again when they are turned out to grass. Whether this be owing to the difference of dry and moist food is not easy to determine, but it is most probably owing to the difference of pasture; the horse at grass, being obliged to carry its head much lower than those which feed in the stable. Those funguses that are fixed on the upper part of the uvea are apt to grow the largest, and to hinder the sight most; and those which grow in the middle of the uvea hinder the sight more by distracting the object than those which grow in either corner or angle of it. The cure is not easy; all that can be attempted must be by dry diet, and attenuating medicines; and a palliative remedy may be the hanging something over to shade the eye, and keeping it from being exposed nakedly to the sun, the consequence of which will be, that the pupil will not be so closely contracted, and consequently the light not so much obstructed. Phil. Trans. N° 32.

FUNIKEDY, in *Geography*, a town of Africa, in Kaarta; 36 miles N. of Kemmoo.

FUNIS, or Funiculus, *Umbilicalis*, in *Anatomy*, the umbilical chord, which consists of two arteries and a vein, named umbilical, which have the office of keeping up the communication between the circulating organs of the fœtus and the placenta; convoluted on each other, and surrounded by a quantity of gelatinous substance. See Embryo.

Funis *Umbilicalis*, *Presentation of*, in *Midwifery*, is when in labour the navel string descends into the vagina, before the presenting part of the child. It sometimes happens, that on the bursting of the membranes in the course of a labour, and the rushing forth of the waters, the funis umbilicalis, or navel-string, comes down, with or before the presenting part of the fœtus. This rarely happens in a natural labour, or when the breech of the fœtus lies over the os uteri, as the head or breech, by their size and adaptation to the shape of the brim of the pelvis, generally prevent any other body from entering the passage with them. When, however, the funis is of an extraordinary length, it will sometimes enter the pelvis before the head or breech of the child, and consequently precede them. If this case be neglected, and the labour suffered to go on, the funis will be gradually thrust down by the pains, until it frees the external orifice of the vagina, and becoming cold, the blood in the vessels will be congealed, the circulation stopped, and the life of the child extinguished. To prevent this accident, authors have recommended carrying the funis up into the uterus with the hand, beyond the presenting part, and detaining it there, until some part of the child enters, and fills up the brim of the pelvis. To do this the more effectually, we are told to inclose the pendent part of the funis in a linen rag, or in a bag made of soft leather. But these methods, Dr. Denman rightly observes, have rarely been found to succeed, (see his Introduction to the Practice of Midwifery, 4to. p. 559,) the funis generally following the hand, when it is withdrawn, or coming down with the following pains. If we are called in late, and the funis has been down so long that the life of the child is destroyed, or if the child was dead before the commencement of labour, (and in either case we may know that to have happened, from the total want of pulsation in the funis,) the labour may then be conducted in the same manner as if the funis had not presented, as it will not occasion any impediment to the birth. That is, if the head, feet, or breech prove either of them to be the part presenting, the woman is to be encouraged, and the child suffered to come into the world in the way it offers, giving only the assistance directed under the articles *Natural* Labour, Breech, or Feet *presentations*, which see. We should be particularly careful, in this case, to conceal from the mother the death of the child, the knowledge of which, by dispiriting her, might damp, or even put a total stop to the pains, and thence materially retard the labour, or in delicate habits, occasion flooding, or convulsions. On the other hand, if from perceiving a pulsation in the funis we are satisfied the child is alive, instead of making futile and unavailing attempts to return the funis, if the os uteri is sufficiently dilated, or is so soft and yielding as to admit it, we must pass a hand leisurely and slowly into the uterus, whatever may be the presenting part, and turn the child, and bring it by the feet. For the manner of doing this, see Labour, *Preternatural*. But if the head of the child be too far advanced in the pelvis, before we are called, to make this practicable, or safe, we must content ourselves with keeping the funis in the vagina, to prevent its contracting cold, and as far out of the way of pressure as we can, and leave the exclusion of the child to the pains; or if the pains should be slow and feeble, and the head of the child, after descending so low as to press upon the external orifice, should remain there, little moved by the pains, we may assist them, and accelerate the birth by using the lever, or the forceps. The lever, perhaps, will, generally speaking, be most adviseable in this case, as less likely to press or injure the funis, more easy in its application, and more speedy in producing the desired effect.

Funis *Crepitans*. See Cissus.

——*Murænarum*. See Melastoma.

——*Muscarius*. See Uvaria.

——*Quadrangularis*. See Menispermum.

FUNIS *Urens.* See TRAGIA.

FUNK ISLAND, in *Geography*, a ſmall iſland in the Atlantic, near the N.E. coaſt of Newfoundland. N. lat. 50°. W. long. 52° 15'.

FUNKAKUN, a town of Perſia, in the province of Mazanderan; 15 miles W. of Fehrabat.

FUNKS TOWN. See JERUSALEM.

FUNNEL *of a Chimney*, the ſhaft or ſmalleſt part of the chimney from the waiſt upwards. Palladio orders, that the funnel be raiſed three, four, or five feet at leaſt, above the roof, that it may carry the ſmoke clear from the houſe into the air.

Care, too, is to be taken as to the width; becauſe, if it be too wide, the wind will drive back the ſmoke into the room: and if too narrow, the ſmoke will not be able to make its way. Chamber chimneys, therefore, are not to be made narrower than ten or eleven inches; nor broader than fifteen. See CHIMNEY and FLUE.

FUNNEL, in *Enginery*, ſignifies the ſame with culvert, or drain.

FUNNEL, in *Chemiſtry*, &c. a well known inſtrument uſed in decanting and filtering liquors, and made either of glaſs or pewter or tin, or tinned iron, or earthen ware. Some are *ribbed*, in order to ſupport large paper filters; and the funnel, called *ſeparatory*, is intended for the ſeparation of liquids of different ſpecific gravity, by allowing the heavieſt only to drop out of the narrow part of the inſtrument.

FUNNEL *Polype*. See POLYPE.

FUNNEL-*ſhaped Hollows*, in *Geology*, is a phenomenon which Mr. Jameſon has obſerved, (Geognoſy, p. 34. 172.) in gypſeous diſtricts; and we have obſerved ſimilar dimples, or depreſſions, in the chalk ſtrata about Fakenham in Norfolk, and other places, ſeemingly occaſioned by the gradual breaking in of the ſuperficial ſtrata, into cavities in thoſe beneath; as we judge from the ſimilarity of theſe funnel-ſhaped hollows to old ſhafts which have in the miners' phraſe *run-in*.

FUORTI, in *Geography*, a town of Naples, in Abruzzo Citra; 21 miles S.S.E. of Salmona.

FU-RAN. See EPIDENDRUM.

FUR. See DARFUR.

FUR, in *Commerce*, is a general term, compriſing the ſkins of different kinds of wild animals, that are found in high northern latitudes, particularly thoſe forming part of the American continent; ſuch as the beaver, bear, mooſe-deer, marten, mink, woolverin, wolf, &c. &c. &c. When theſe ſkins are in an unimproved ſtate, as they come from the hands of the Indian hunters, they properly claſs under the denomination of *peltry*; but when they have had the inner ſide converted into leather, by an aluminous proceſs, they then aſſume the appellation of furs; and the art of thus manufacturing them is called *furriery*.

FURS, or *Furrs*, is a term, in its confined ſenſe, applied to the ſkins of different hairy quadrupeds, when they have undergone an aluminous proceſs, by which the inſide integuments are converted into a kind of coriaceous ſubſtance. In this view *furs* differ from *peltries*, which are the ſame ſkins in the ſtate they are taken from the animals, and ſimply dried, or in a ſtricter meaning of the word, the latter only compriſes ſkins covered with ſhort hair, as the deer, elk, buffaloe, &c., principally manufactured into leather. But in a general ſenſe, the term fur includes all kinds of ſkins which are uſed in furriery, *viz.* bear, beaver, mink, marten, otter, fox, ermine, ſable, ſquirrel, cat, hare, rabbit, &c. Reſpecting the relative eſtimation of the various kinds much appears to depend upon the ſeveral uſes to which they are generally applied; and their intrinſic value upon the climate, whence they are brought, the age or health of the animals, and the ſeaſon of the year when caught and killed. It has been frequently remarked by natural hiſtorians, that the colder the country, the larger and warmer is the fur of each animal; it being wiſely provided in the economy of nature, that the clothing of the inhabitant ſhould be adapted to the rigours of his ſituation. Thus the fox and wolf, which in temperate climates have but comparatively ſhort hair, in the frozen regions near the pole are covered with a fine long and thick fur. The beaver and the ermine, which are found in the greateſt plenty in high northern latitudes, are remarkable for the warmth and delicacy of their furs. It is not an eaſy taſk to account for this remarkable warmth of furs in northern quadrupeds. Some have ſuppoſed it originates in ſpare and ſcanty diet, with the difficulty of obtaining food, to which animals in ſuch climates are ſubjected. Others, with more probability, have aſcribed it to the ſeverity of the cold, contracting the pores of the ſkin, ſo that the hair conſequently takes the ſhape or ſize of the orifice through which it grows; as wires are made ſmaller and longer by being drawn through narrower apertures. From whatever cauſe it may ariſe, ſuch is the fact; and farther, all the animals of the arctic climates may be ſaid to have their winter and ſummer garments, except very far to the north, where the cold is ſo continually intenſe, that, according to Crantz, no change of colour is perceivable either in the fox or bear. Hence it is, that the furs of high northern latitudes are better in quality than thoſe of more temperate climes; the produce of Siberia ſuperior to thoſe of Ruſſia; and the imports from Canada preferable to thoſe from the United States. This fact alſo accounts for the difference of value in ſimilar articles brought from the ſame country; for during winter the furs of moſt animals improve both in quality and colour. Indeed ſome kinds, as thoſe of the iſatis or croſs fox, unleſs killed at that ſeaſon, are in no eſtimation.

Of the leaſt valuable among the kinds of furs, thoſe of the rabbit and hare may be claſſed, although they are more generally known from the circumſtance of their forming a conſiderable article in the hat manufacture; for which purpoſe vaſt quantities are imported from thoſe countries bordering on the polar regions, where they are found as white as the ſnow they traverſe, and in ſuch plenty, that they are ſold on the ſpot, or rather bartered for the value of five ſhillings per hundred. It is not eaſy to aſcertain the exact time when furs were firſt uſed in the hat trade. The ſtipulations for the preſervation of rabbits in different treaties reſpecting Calais, ſigned between the Engliſh and French, previouſly to the year 1440, have induced ſome writers to ſuppoſe the improvement was adopted about the beginning of the fifteenth century. But even in the time of Elizabeth the wearing of hats was reſtricted by act of parliament to the upper claſſes in ſociety; the middling and lower being confined, under forfeiture of a penalty, to the uſe of knit caps. This act, however, was ſoon after repealed, and the uſe of felt hats, and others manufactured from fur, came into general wear. In 1638, king Charles having incorporated the makers of theſe hats and caps into a privileged company, he affixed regulations for the trade, prohibited the importation of beaver hats, and reſtricted the hatters to the uſe of that article, allowing the admixture of other ſubſtances, only in hats and caps, called *demi-caſtors*, intended for importation. From this period may be dated the increaſe in the value of the beaver fur, which now ſupplies that manufacture with its moſt valuable commodity. Of beavers, the ſkins

ſkins of the middle-aged or the young, called cub-beaver, is the moſt valuable, the wool being the fineſt, moſt gloſſy, and ſuſceptible of the moſt permanent dye.

Fox ſkins furniſh a conſiderable variety of furs. In the cold countries animals of this ſpecies are of all colours, white, grey, blue, iron-grey, ſilver-grey, variegated and black. Of theſe, the laſt is the moſt valuable, and the firſt the leaſt. The hair of the white fox is very liable to fall off; the blue are ſought for with avidity, owing to their ſcarcity; and the black fetch a high price, from their juſtly acknowledged beauty. The generality of this kind of ſkins, like thoſe of the wolf and bear, are manufactured into muffs, tippets, cloaks, and other defenſative articles of winter dreſs.

The different ſpecies of animals which conſtitute the weaſel genus furniſh many of the fineſt and moſt generally eſteemed furs. The fur of the wild-cat is ſoft and warm, but from an offenſive ſmell, which it tenaciouſly retains, the value falls below that of others of a very inferior kind. The marten affords a ſkin of various colours, but the part of it held in the higheſt eſtimation is that browner than the reſt, extending along the ſpine. The ſkin of the ſable is highly coveted, which is in colour a browniſh black, and the darker the more deſirable it becomes. The fur of this animal is finer, ſofter, and more gloſſy than that of any other quadruped, except its equally eſtimable congener the ermine, which is the moſt valuable of any hitherto known. In ſummer the ermine is brown, and called the ſtoat. It is in winter only that this little animal has its fur of the proper colour and conſiſtence. At the approach of the inclement ſeaſon the hair, from being coarſe and ſhort, lengthens and grows finer, while numerous ſmaller hairs riſe up between the longer, thicken the coat, and give it all the warmth and ſoftneſs which is ſo much admired in the furs of northern animals, and ſets ſo high a price upon their ſkins. The ſnowy whiteneſs which the ermine's fur aſſumes at that time of the year confers on it alſo an additional value.

Many other animals afford furs of various qualities, which, according to their uſes, differ as to the degree of eſtimation in which they are held; as the woolverin, raccoon, muſquaſh, genet, and ſloth, the fur of which laſt poſſeſſes ſuch a beautiful luſtre as to give it the preference to that of all other animals, except the ermine, ſable, and Siberian fox. Another fur-bearing animal of the American continent, and lately diſcovered, muſt not paſs unnoticed, becauſe it is likely, at no diſtant period, greatly to enhance the importance of the trade in articles of this deſcription, the ſea-otter. This inhabitant of the New World furniſhes a complete rival to any in the Old; its fur being, in the opinion of experienced judges, the fineſt and moſt deſirable for many purpoſes of any yet produced in all parts of the globe. Captain Clarke, who ſucceeded captain Cook, collected a quantity in the vicinity of Nootka Sound, and carried them to China, where they ſold as high as one hundred dollars per ſkin. The account of this induced other adventurers to open a trade to Canton; but the Chineſe emperor, jealous of European communication, quickly prohibited this branch of commerce. The Columbia, Miſſouri, and other rivers, which riſing in the north-weſt parts of America, fall into the great Pacific ocean, are known to abound with ſea-otters; and theſe will probably ſoon furniſh a new ſource of profitable ſpeculation.

Fur *Trade*. The uſe of furs and peltry is nearly coeval with the hiſtory of man. From the primeval pair having been clad in veſtments of ſkins, the cuſtom of adopting ſuch a kind of dreſs was obviouſly deduced, and the multiplication, and ſubſequent diſperſion of mankind, for peopling the earth, would extend and perpetuate the uſage during the firſt ſtages of civilization.

> "————————Cum frigida parvas
> Præberet ſpelunca domos, ignemque Laremque,
> Et pecus & dominos communi clauderet umbra:
> Silveſtrem montana torum cum ſterneret uxor
> Frondibus, & culmo vicinarumque ferarum
> *Pellibus*."
>
> Juvenal Sat. l. vi.

Accordingly, hiſtorians and poets deſcribe people in the ruder ages of the world, when hunting and fighting appear to have been their principal employment, as uſually clothed in this manner: and the cuſtom would prevail till art had taught the ſuperior advantages of wool, and invention afforded her aſſiſtance in its multifarious fabrication. Thus Virgil, when he deſcribes Æneas about to take his departure from Troy, repreſents him as having his outer veſt formed of a lion's ſkin.

> "Hæc fatus, lateros humeros ſubjectaque colla
> Veſte ſuper fulvique inſternor *pelle* leonis."
>
> Æneid, lib. ii.

In book the fifth, he depicts Aceſtes as formidably clad in the ſkin of a Libyan bear.

In the various iſlands and countries lately brought to our knowledge by numerous voyages of diſcovery, and where the arts appear in a ſtate of infancy, the uſage of wearing furs and ſkins is ſtill prevalent among the natives; from the northern point of Kamtſchatka to the moſt ſoutherly iſlands in the Pacific ocean, from the ſeats of the Nathana and Quarrelling Indians to the great wall which ſeparates China from the Siberian deſarts. As tribes multiplied, cultivation increaſed, and conſequently woods diminiſhed, the haunts of undomeſticated animals would become more diſtant from the habitations of man; hunting and killing them would thus become more toilſome, which muſt neceſſarily enhance the value of ſkins, and what originally were conſidered as cheap and common neceſſaries, would at length be claſſed among the more valuable and coſtly commodities. In the ſacred book of Exodus, among the offerings made towards erecting the tabernacle for Jehovah, are enumerated purple, ſcarlet, and fine linen, with goat-ſkins, red ſkins of rams, and badger ſkins. The ſacred book of Numbers, which contains precepts for purification, provides that every thing made of ſkins, and all goods manufactured from goats' hair, were in a particular manner to be purged; becauſe they were calculated to retain longer the principles of contagion. From which paſſages it appears, that ſkins were not only uſed for furniſhing ſome portions of dreſs; but were alſo conſidered of great value long ſubſequent to the time when the arts of weaving and dyeing were diſcovered.

At what period, or among what people, furs became an article of luxury, is a ſubject on which little can be collected for elucidation. They do not appear to have conſtituted any part of dreſs worn by the patrician orders in the enlightened nations of Greece and Rome. Their uſe was probably confined to the northern parts of Aſia and Europe; and the cuſtom afterwards might have been extended to the middle and ſouthern parts of the latter continent, by thoſe immenſe hordes, which deſcended and deluged the Roman empire like a flood, the Goths and Vandals.

The hiſtory of various nations tends to ſhew that furs were anciently uſed to ornament the robes of princes, grandees, and perſons delegated with high authority. Veſtiges of their uſe in theſe reſpects are ſtill viſible in England, in the ſtate robes of the king, the nobility, judges, and other perſons

ſons of diſtinction, and in the public dreſſes of the chief magiſtrates, and officers in municipal corporate bodies. Their uſe is diſtinctly traceable in the bordering, impaling, quartering, and divers forms belonging to emblazonry in armorial bearings; where vair and ermine ſtill hold a conſpicuous rank. All which demonſtrate the prevalence of the cuſtom of furred garments in ages far remote from the preſent.

Of the fur trade at an early period, little has been recorded, though it certainly muſt have formed a conſiderable branch of commerce. There exiſted ſeveral reaſons why little has been detailed on this ſubject, as to the nature, extent, or mode in which the merchandize in furs and peltry was conducted. Previouſly to the diſcovery of the New World by Columbus, the furs, in general demand for Europe, were procured from the north and north-eaſtern parts of the Ruſſian empire. The diſcovery and annexation of the extenſive territory of Siberia in the ſixteenth century added greatly to the wealth and power of Ruſſia, by the numerous fiſheries, iron works, and particularly by the extenſive field it opened for the trade in furs. But previouſly to the direct communication with that empire by the Ruſſian company, formed under the auſpices of the celebrated Sebaſtian Cabot, and the diſcovery of the port of Archangel by captain Richard Chandler, the fur trade in the north-eaſt had been carried on through the ports of Livonia, lately poſſeſſed by the Teutonic knights of St. Mary of Jeruſalem, a republic, of which the Hanſeatic towns not along ago were the only remaining part; the Ruſſians, anterior to that period, not poſſeſſing any ſea-ports or ſhipping on the ſhores of the Baltic. Thus the articles, which conſtituted this department of commerce, found their way to a market by the interior of the north of Europe. In conſequence of this circuitous conveyance, the deſpotic nature of the Ruſſian monarchs, and the narrow policy adopted by that government, it was ſcarcely known for a long period from what particular places, or by what mode of intercourſe the furs and ſkins were procured. But the Livonian war having greatly injured the trade, the czar was induced to aecede to the requeſt of the Engliſh merchants for permiſſion to trade directly to the Ruſſian coaſt.

The diſcovery and colonization of America, particularly the northern parts of it, bordering on the gulf of St. Lawrence and Hudſon's bay, gave a new turn to mercantile ſpeculations in furs and peltry.

Hudſon's bay was diſcovered by ſir Thomas Burton, and further ſurveyed in queſt of a north-weſt paſſage during the reign of Charles the Firſt, by captain Luke Fox. Afterwards prince Rupert, and ſeveral noble aſſociates, having ſent out captain Newland, on an exploratory voyage to the bay, and finding by the narrative of his proceedings that an advantageous commerce might be carried on with that part of the American continent, they determined to form an united company for the purpoſe of opening a new ſource of trade and wealth. In this purſuit they were encouraged by the return and ſuccefsful adventure of captain Gillam, who about the ſame period had been diſpatched on a trading voyage by ſome merchants of Briſtol. An application to the crown obtained for the aſſociation a charter for the excluſive right to attempt the diſcovery of a north-weſt paſſage, to proceed in that direction on mining inveſtigations, and to open with the natives of the Terra Incognita a trade in furs. By this charter, dated May 2, 1670, they were incorporated under the title of the governor and company of adventurers of England, trading to Hudſon's bay, with the ſole and excluſive privilege of navigating in all ſeas, bays, ſtraits, creeks, lakes, rivers, ſounds, &c. that lie within the entrance of the ſtraits, commonly called "Hudſon's ſtraits." This charter was a very ample one, and for a time had a moſt diſaſtrouſly excluſive effect upon the trade in furs. But ſuch charters, happily for commerce, were greatly abridged of their extenſive privileges, by one of thoſe eminent bulwarks of Engliſh liberty, which have at ſeveral important epochs diſtinguiſhed the conſtitution of Britain. By a ſtatute, enacted in the firſt year of king William and queen Mary, entitled "An act for declaring the rights and liberties of the ſubject, and ſettling the ſucceſſion of the crown," the privileges of the company, like every other not ſanctioned by an act of the legiſlature, were diſannulled, and though they ſtill pretend to poſſeſs prohibitory powers, every Britiſh ſubject has an equal right to participate in the trade to that quarter. Their firſt factory, fort, or eſtabliſhment on Nelſon river, was formed in the year 1682, and a Mr. John Bridgar was made governor. Soon after they ſet up others in different parts of the bay; but the French, who were jealous of the interference with the Indians, in the vicinity of their Canadian ſettlements, ſeized upon the forts, and diſpoſſeſſed the ſettlers. On application to the French court reſpecting this outrage, it was deemed a piratical act, and the king of France, as an indemnity, gave the company the French fort and factory on the river Hayes. Although the French in Canada did not at firſt pretend to a property in the countries about Hudſon's bay, yet in a few years after the company was eſtabliſhed, ſo early as 1674, their jealouſy of the Engliſh enterprize was very manifeſt. They became exceedingly troubleſome to the outpoſts, and erected a fort within eight days journey of the ſettlement on prince Rupert's river. They alſo endeavoured, by underſelling us in their barter with the Indians, to ruin our trade and intereſt with thoſe ſavages, which they were enabled effectually to do by their contiguity; the neareſt parts of Canada not being diſtant more than 150 miles from the above mentioned factory at fort Nelſon.

From this period, till the year 1714, the company's people were frequently annoyed and haraſſed by their litigious and ambitious neighbours; till, by the treaty of Utrecht, lines of demarcation were drawn between the two countries, and definitive articles agreed upon relative to the trade. After this they extended their concerns, and erected new ſettlements. In 1730 they poſſeſſed five, *viz.* on Albany river, Hayes's iſland, Rupert's river, Port Nelſon, and New Severn. The country about Hudſon's bay is very inhoſpitable and unfriendly to vegetable productions; for even in the ſouthern part, in the latitude of 51 degrees, it is exceſſively cold nine months in the year. In ſo wretched a country, therefore, there can be no plantations, properly ſo called, nor any towns and villages. The reſident traders therefore muſt be ſupplied with bread, beef, pork, flour, peas, and other neceſſaries from England, or ſome parts of America. With the poor ſavages of the country, commerce can be conducted by no other means than *barter;* and the beaver is made the medium, or agio, of exchange. Thus, for inſtance, the company for one beaver's ſkin, at one period, gave half a pound of gunpowder, four pound weight of lead ſhot, two hatchets, half a pound of glaſs-beads, one pound weight of tobacco, eight ſmall, or ſix large knives, one large and two ſmall powder horns. For 12 good winter-beaver ſkins, a gun of the beſt ſort; for eight do. the ſmalleſt ſized gun; for ſix do. a good laced coat; for five do. a plain red coat; for four do. a woman's coat; and ſo proportionably for kettles, looking-glaſſes, combs, &c. Arthur Dobbes, eſq. who publiſhed, in 1743, an account of Hudſon's bay, furniſhes this ratio of exchange between the company's agents and the Indians. A beaver ſkin, he ſays, as the medium of circulation, is the eſtabliſhed price of the

under-

undermentioned articles, *viz.* a pound weight of brafs kettles, one and a half pound of gunpowder; five pounds of lead fhot, fix pounds of Brazil tobacco; one yard of bays, two combs; two yards of gartering, one pair of breeches, one piftol, or two hatchets. Other kinds of goods procured from the favages are doubtlefs valued in a fimilar manner, although he has not detailed the refpective proportions. In the catalogue of Britifh manufactures given in lieu of them, he enumerates the following; "glafs-beads, black-lead, fugar, thread, vermilion, brandy, broad cloth, blankets, duffels, flannel, awl-blades, buttons, fifh-hooks, fire-fteels, files, guns, flints, yarn, mittens, handkerchiefs, hats, hawk-bells, knives, ice-chiffels, looking-glaffes, needles, net-lines, rings, runlets, fword-blades, fpoons, fhirts, fhoes, ftockings, fafhes, worfted, thimbles, tobacco-boxes, tongs, trunks, wine, &c. &c."

This year, 1730, the company imported 11,040 coat and parchment beaver fkins; 4404 do. cubs; 3330 damaged and ftage-parchment; 990 do. cubs; 1648 martens, 3130 damaged do.; 380 otter fkins; 890 cat fkins; 260 fox fkins; 540 woolverins; 400 black bear fkins; 190 wolves fkins; and 30 wood-fhocks. In 1737, the company exported to the value of 4124*l.* 18*s.* 2*d.* The year following, 3879*l.* The fame author gives the following ftatement of one of the company's fales in the year 1740, *viz.* "17,780 beaver fkins, and 49,600 fkins of all kinds, 2360 pound weight of bed feathers, 160 of caftoreum, 610 whale fins, and 120 gallons of whale oil." He further obferves, "that as there are two fales every year, and the company referves three-fifths of their beaver fkins for their fecond fale, but no other fkins; then the fecond fale muft have had 26,670 beaver fkins, and both the fales muft have furnifhed 44,450 beaver fkins." He has alfo given the company's entire fale for the year 1743, with the prices affixed, *viz.*

		£.	s.	d.
26,750	Beaver fkins, fold for	9780	4	0
12,370	Martens fkins, do.	4242	7	0
2,360	Damaged do. do.	442	10	0
590	Otter fkins, do.	413	0	0
850	Cat fkins, do.	413	0	0
260	Damaged do. do.	52	0	0
320	Foxes	200	0	0
600	Woolverins	205	0	0
170	Do. damaged	27	12	0
320	Black bears	368	0	0
1580	Wolves	1580	0	0
270	Do. damaged and ftags	123	15	0
40	Woodfhock fkins	22	6	0
10	Mink fkins	1	10	0
5	Raccoon fkins	0	16	0
120	Squirrel fkins	2	0	0
		17,874	0	0

The following articles he adds without enumerating their prices, *viz.* 130 elk fkins, 440 deer fkins, 3170 pound of bed-feathers, and 220 pound in a tick, 140 caftoreum, 470 whale-fins, 23 cafks of whale oil, and 8 pound of wefaguipaka.

	£.	s.	d.
And in their March fale, 40,125 beavers, worth	14,670	0	0
Unvalued goods, about	400	0	0
Total amount of the trade in 1743	33,396	0	0

A literary controverfy, between Mr. Dobbes and Capt. Middleton, concerning the paffage through Hudfon's bay weftward to China, and the nature of the company's trade with the favages, has brought to light more particulars for the illuftration of this fubject, than either the company would have been inclined, or the public could have expected them to communicate. Upon the allegations, in thefe and other pamphlets, refpecting a north-weft paffage to the fea of Japan, that the Hudfon's bay company had not hitherto encouraged any attempts for the difcovery of fuch a paffage, and that a more extenfive and beneficial commerce might be carried on with the countries bordering on the bay, if the trade were laid open; the houfe of commons appointed a committee to inquire into the truth of fuch ftatements. By the papers and books produced on that occafion, it appears the original fund of the company was 10,500*l.* This, in the year 1690, was trebled, making 31,500*l.*; which was again trebled in 1720, amounting to 94,500*l.*; and by a partial payment of 10*l.* per cent. on a new fcheme of enlargement, the capital was augmented to 103,500*l.* Mr. Robfon, who had fome years been furveyor for the company, and on this occafion feemed rather a difgufted evidence againft them, informs us the company's four fmall factories contained only 130 fervants, and two fmall houfes, with eight men in each; the value of their annual exports was about 4000*l.*; and that in time of peace they employed three fhips of 150 to 200 tons burthen, with two or three fmall floops, conftantly ftationed in the bay. The company, he obferved, have always been extremely averfe either to make difcoveries, or permit others to attempt fuch undertakings, apprehenfive, whenever the improvable value of the colony and trade fhould be known, government might be inclined to take the one under its own protection, and to lay open the other to the nation at large. They, therefore, have contented themfelves with dividing among only a hundred perfons a large profit upon a fmall capital. This profit, according to his ftatement from the documents laid before the parliament, is enormous. Taking the beaver fkin as the ftandard, he thus proceeds, "for a quart of Englifh fpirits, which the company export at fix-pence, and before they fell it to the natives, mix it with one-third water, which reduces it to four-pence; they take a beaver fkin, which has been fold at the company's fale, at a medium of ten years, for fix fhillings three farthings the pound, and a beaver-fkin generally weighs a pound and a half; fo that they get nine fhillings and one penny for four-pence, which is 2700*l.* per cent. profit. Upon other articles not fo material, they do not gain above 500*l.* or 600*l.* per cent.; but in exchange for martens the profit is double of that upon beaver; for they value three martens only as one beaver, and thofe, at a medium of ten years, have fold for fix fhillings a fkin. It appears alfo from the ftandard that one-third more is charged upon many articles at Nelfon and Churchill factories, than at Moofe and Albany; thofe factories being farther from the French, who till within thefe few years had not intercepted the trade there; and not content even with this extravagant profit, the factors are allowed to fell their goods confiderably above the ftandard, which is called the profit upon the *overplus* trade; yet with all this advance upon their goods the company is reduced by the expence of management, fhipping, factories, officers, and fervants, to a little more than 200*l.* per cent. For by a medium of ten years trade, their fales amount annually to 27,354*l.* 5*s.* 5¼*d.* and their expences to 19,417*l.* 8*s.* 6*d.*; their net profit, therefore, at the fame medium, amounts to 7,936*l.* 16*s.* 11¾*d.* which upon 3,674*l.* 3*s.* 1¾*d.*, their annual export at the fame medium, is about 216*l.* per cent. profit upon the annual ftock in trade, and near 7¾*l.* upon the

the nominal capital of 103,95*l*."—But from this ftatement, compared with Mr. Dobbes's, the profits of the concern are by no means fo enviable as might at the firft glance be imagined. For upon viewing the proceeds of the company's fales, it may be obferved, that if their capital ftock be about 100,000*l*. that thereon they had not for many years divided more than 10*l*. per cent, and if the fale in 1743 be any rule to determine for other years; the reft being abforbed in the company's annual expences for fhipping, forts, garrifons, falaries, and home charges, which may amount to about 20,000*l*. So that although Mr. Dobbes has evidently fpared no exertions to become mafter of his fubject, yet, after all, confidering the rifks to which the company are conftantly liable, their gains, as captain Middleton obferves, "are little to be envied. Indeed their recent dividends of eight per cent. form no very alluring object for mercantile fpeculation. The laft mentioned author, in his pamphlet, printed in 1743, ftates, "that until a little above twenty years before, the voyage to Hudfon's bay was feldom made without wintering there." This fhews the company have by that alteration made a confiderable improvement, and great faving muft accrue from fuch an economical meafure. But the exifting neceffary expences might be materially diminifhed, except in the article of freight, if the trade were laid open, the country fettled, and the poffeffions thus fecured without charge; whilft the exports and imports would be greatly increafed, perhaps as fome have calculated, to one hundred times their prefent value, for there is a fufficient fcope; and an extent of country, which by proper cultivation, and due encouragement to the natives, to fupport the computation. Indeed this latter meafure, the civilization of the Indians, is highly defirable; for by inftructing them in the knowledge of ufeful arts, and inducing them to attain habits of induftry, by allowing a fair and equitable trade, a folid foundation might thus be laid for their converfion to Chriftianity.

Refpecting the future progrefs of the trade, and the nature of its concerns, little more can be collected than what is furnifhed by the invoices of the cargoes, imported in the company's fhips; and the reports of their public fales. For fubfequent to the parliamentary inveftigation they have been unufually jealous of inquiry, and peculiarly tenacious of information. A few notices, extracted from thefe, will ferve to elucidate fimilar kinds of ftatements; which will be found in the fubfequent account of the Canadian branch of this commerce. From the time of Mr. Dobbes's ftatement, the concern for fome years was evidently on the decline; but after the American war had terminated in eftablifhing the independence of the United States, this, among other kinds of traffic, was more vigoroufly purfued with thofe parts of America ftill fubject to the crown of Great Britain. The importation of the year 1789 affords the following refult, *viz.* "Coat beaver fkins 4,900; parchment ditto 26,750; cub ditto 14,900; marten 25,900; otter 2,650; cat 1,530; fox 3,790; woolverin 240; bear 400; wolf 2,420; fifher 160; mink 460; raccoon 480; mufquafh 5,200; elk 26; deer in the hair 2,980; rabbit 5,000." In the year 1791 the company made an alteration in the mode of fale. Inftead of allotting the different fkins and furs according to their kind, they arranged each kind in fix different claffes, according to their refpective goodnefs and value; but more efpecially with the view to the various ufes to which they might be applied. By the adoption of this plan, the company became wholefale furriers, as well as importing merchants; and by dividing of qualities, and defignating ufes, united the double profits of two very beneficial concerns.

The following is the ftatement, in the report of the fale for 1791.

	AR	MR	EM	YF	SR	CR
Coat beaver -	1100	50	34	1957	104	1133
Parchment do. -	7387	2899	3047	18,493	4047	4738
Cub do. - -	2227	651	550	1848	880	350
Marten - -	6499	2641	3614	1947	3773	2471
Otter - -	4524	506	485	441	600	149
Cat - -	477	228	43	748	86	21
Fox - -	227	281	2142	2811	143	221
Woolverin - -	11	2	6	138	7	38
Black bear -	205	100	77	36	26	3
White do. - -	—	—	6	6	—	—
Wolf - -	5	—	19	3174	14	19
Fifher - -	72	46	27	37	—	—
Mink - -	204	159	44	119	—	50
Raccoon - -	203	180	183	38	—	—
Mufquafh - -	2197	5960	580	180	51	36
Deer - -	39	—	324	1218	1313	142
Rabbit - -	2749	1530	3233	1286	496	—
Squirrel - -	—	—	152	144	—	20

The greateft importation the company appears to have made, was in the year 1794, which amounted, as per invoice of cargoes, to 37,777 parchment beaver fkins; coat do. 4024; cub do. 14,740; and the various kind of fkins nearly in an equal proportion. From this period the decline of imports is evident from almoft every annual fale report. That for 1807 and 1808 will exhibit very nearly the prefent ftate of the company's trade.

	AR	MR	EM	YF	SR	CR
Beaver coat lbs.	125	36	—	433	90	327
Do. parchment whole fkins	4869	2619	553	3304	781	1279
Do. cub - -	2732	1604	302	1593	404	692
Marten - -	10,965	5613	3291	9270	6131	4912
Otter - -	988	382	339	953	611	174
Cat - -	125	360	116	273	17	161
Fox, about 2500 white	3439	338	1960	6986	335	226
Woolverin -	34	—	19	174	14	72
Black bear -	165	43	76	146	5	79
White do. -	11	—	4	4	30	3
Wolf - -	1669	2	14	2475	2	98
Fifher - -	284	37	—	95	—	1
Mink - -	395	405	76	831	63	110
Raccoon -	794	120	241	295	—	50
Mufquafh -	1552	4683	1795	11,698	600	718
Deer - -	292	—	51	3453	—	645
Rabbit - -	2886	2910	6865	18,185	3900	—
Swan -	—	—	—	396	—	—

The following is the amount of the quantity imported by the Hudfon's bay company in the year 1808, as appears from the fale report for 1809, *viz.* beaver coat 1684 lbs.; ditto whole parchment fkins 20,821; ditto cub ditto 12,063; mufquafh 33,706; otter 5077; cat 2788; fox 1370; ditto kitt 2371; woolverin 163; bear, black, 971; ditto, white, 89; wolf 3704; fifher 71 mink 3185; rac-

coon

coon 5339; deer 5339; ſwan 1067; ſquirrel 905; rabbit, 25,914. The higheſt price of coat beaver was nineteen ſhillings and ſixpence per pound, the average fifteen and ſixpence; parchment ditto twenty-three ſhillings and ninepence, average ditto, twenty-one ſhillings and fourpence; cub ditto, twenty-three ſhillings, average ditto, twenty-one ſhillings and eight-pence. In this ſtatement, it is proper to obſerve, that theſe prices were obtained for the prime and fair articles; what are called damaged and *ſtaged* ſkins, of which there is a very conſiderable portion in every annual importation, are ſold at very inferior ſums.

Canada, the grand entrepot, or market of communication for the trade in furs and peltry, was firſt colonized by the French, who viſited America for the purpoſe in 1540; when M. Cartier and baron Roberval, with about 200 men and women, as ſettlers, ſailed from St. Maloes with five ſhips, and proceeded up the river St. Lawrence, four leagues above the haven of St. Croix; where, having landed, they conſtructed a fort for the protection of the infant colony. Emigration and population proceeded ſo rapidly, that the country, near the north bank of the river St. Lawrence, ſoon became well peopled, ſo that from the account given of it by governor Lahontan, about the end of the ſixteenth century, the number of inhabitants amounted to 180,000. In the year 1603, the French went higher up the river, and began to ſettle in the country now called Canada, or New France, on the north ſide of the river, and erected houſes at the point of Trois Rivieres; but they did not extend ſo high as Quebec till the year 1608. They continued to erect habitations and forts in the ſame direction, between Quebec and Montreal till 1629, when the country was taken by an Engliſh force under the command of ſir David Kirk, but was ſhortly reſtored again to France. For a ſeries of years this valuable territory was much neglected by the mother country. During a long time the further colonization was left to private individuals, who fitted out expeditions of adventure at their own expence. Theſe were uſually men of rank and fortune, who obtained from the government an excluſive right to trade with the native Indians for divers kinds of furs and peltries, then the principal articles of Canadian commerce. But experience quickly demonſtrated that theſe expeditions were upon too ſmall a ſcale to inſure either the ſucceſs or the ſafety of the ſettlers, who were conſequently ſubject to be haraſſed by continual incurſions of the Indians for the ſake of plunder. From the year 1535, when it is ſaid Quebec was firſt diſcovered, to the year 1664, the government and trade of Canada were entruſted to private merchants, holding under patents, granted by the king of France. In the year 1664, the two departments were ſeparated, and changed poſſeſſors; the crown aſſuming the government, while the trade was put excluſively in poſſeſſion of the company des Indes Occidentales. But even after the French government had taken the colony under its own more immediate care, greater attention appears to have been paid to the ſpreading of the Roman catholic religion, by numerous miſſionaries exploring the interior, and cultivating friendſhip with the various Indian tribes, for the furtherance of the fur trade; than to the internal improvement of the country, by agriculture and arts. Indeed, from the firſt ſettlement of Canada, the fur trade was conſidered of the greateſt importance to the colony. Soon in the vicinity of the trading ſettlements, the ſkins of ſuch animals as were deemed precious in a commercial view, became ſcarce and daily more valuable. To procure the neceſſary ſupplies, the Indians were conſtrained to penetrate farther, and explore the diſtant woods for hunting purſuits, in which they were often accompanied by native Canadians. Theſe in time, by means of the intercourſe they thus obtained with perſons belonging to the remoter tribes, induced the latter to bring to the ſettlements belonging to the trade the kind of ſkins which were moſt in demaud. Such Canadians, who thus conſorted with the Indians in theſe hunting excurſions, were denominated "Coureurs des bois," and becoming a kind of pedlars or middle men, proved extremely uſeful to merchants engaged in the trade; who found it their intereſt to grant the neceſſary credit, to enable them to undertake their commercial ſpeculations. Three or four of theſe pedlars would put their property, as a joint ſtock, into a canoe conſtructed of birch-bark, which they would navigate up the rivers and lakes, and either aſcend to the places where the natives were accuſtomed to hunt, or to ſuch as they were uſed to frequent, for the purpoſes of trade. At length, to ſuch an extent did they proceed, that theſe voyages would take up from twelve to fifteen months, when the adventurers would return freighted with rich cargoes of furs, attended by numerous canoes, containing ſtill more, belonging to the Indians. The diſſolute lives of theſe men, however, tending to obſtruct the work of the miſſionaries, and leſſen the Canadians in the eyes of the natives, the ſuppreſſion of ſuch a claſs of men was attempted by an edict prohibiting any perſon from going up the country without a licence from government. But theſe licences being transferable, many of them came into the hands of the merchants, who, as they formerly did, had recourſe to the agency of the coureurs des bois, which cauſed a renewal of the former complaints; in conſequence of which, military poſts were eſtabliſhed at the confluence of the different large lakes of Canada; a meaſure which tended in a great degree to check the evil conſequences ariſing from the improper conduct of the foreſters. The trade alſo flowed in more numerous and profitable channels. Many reſpectable men, retired from the army, proſecuted the concern in perſon with great regularity, under their reſpective licences; and by perſevering induſtry extended it to ſuch a diſtance, as in that period was conſidered an aſtoniſhing effort of commercial enterprize. Theſe traders, and their miſſionaries, having combined their views, and agreed to act with concert, in the courſe of time ſecured the reſpect of the natives, and the obedience of the people neceſſarily employed in the laborious departments of the concern. Theſe religious men were of extenſive ſervice to the *commanders*, as the licenced traders were denominated, engaged in thoſe diſtant expeditions to the remote ſettlements, and enabled them to carry the fur trade as far as the banks of the river Saſkatchiwine, in latitude 53° north, and longitude 102° weſt. Thus expanded was it, notwithſtanding the reſtrictions by which commerce was oppreſſed under the French government; and thus did it ſurmount many of the moſt diſcouraging obſtacles; while at the ſame time no exertions were made from the people of Hudſon's bay to obtain the ſmalleſt ſhare in the trade of a country, which, according to the charter of that company, formed part of their own poſſeſſions; and, from its proximity, is acceſſible with ſo little comparative difficulty to the mercantile adventurer.

What the quantity of furs and ſkins was, on an annual average, that France imported from Canada, previouſly to the ceſſion of the province to the Engliſh, it is not eaſy accurately to aſcertain. Mr. Dobbes has given an enumeration of the peltry imported in the year 1743 by the port of Rochelle, the principal import place, *viz.* beaver ſkins 172,080; bear do. 16,512; raccoon do. 110,000; marten do. 30,325, otter and fiſher do. 12,428; mink do. 1700; fine cat do. 1220; wolve do. 1267; woolverins 92; grey

fox,

fox, and cat do. 10,280; red fox do. 451: total 311,355 skins, worth about 120,000 *l.* sterling.

On the 8th of September, 1760, the town of Montreal, together with the rest of Canada, was surrendered to the British forces, under the command of general Amherst, by the French general M. Vaudreuille; and in the treaty of peace, concluded in 1763, the whole province, and its dependencies, were ceded to Great Britain. From this invaluable acquisition, not only did the country obtain a vast addition of territory; but, what is of very great importance, became possessed of the entire fur and peltry trade of the American continent. And though a portion of it was again alienated by the act, which declared the independence of the United States, yet while we retain the country on the banks of the great river St. Lawrence, the key to the lakes, and the land of furs, it must ever be carried on by this kingdom to the most considerable extent. Canada now become a British province, the lords of plantation addressed the king, that the trade might be put under the same regulations with that of the other colonies, except such cases as might be otherwise provided for by the articles of capitulation and cession. Large orders for furs were now forwarded to this country from Flanders and other places on the continent, and even from Russia, which, though considered a fur country, does not produce a sufficient quantity for the supply of its own wants. But though the demands in the market were great, yet for some time after the conquest this trade appeared almost suspended; owing to an ignorance of the country in the conquerors, their want of commercial confidence in the conquered, and the numerous discouragements arising from the hostile dispositions of the Indian tribes, who had been in alliance with the French. Hence it was, that so late as the year 1766, the trade from Michilemakinac only commenced. In the undermentioned years, Mr. Macpherson gives the number of skins, or furs, exported from the province of Canada, according to the returns from the offices at Quebec; where the species of furs are not distinguished, but simply entered under one head of, "peltries, skins,"

1764, 106,035 skins, besides 58 casks, 207 bales, and 1 trunk, whereof the contents are not ascertained.
1765, 275,206.
1766, 346,749.

Some of the adventurers now proceeded beyond Grande Portage, situated on a bay in latitude 48° north, and 90° west longitude, which has since that period become the principal north-western entrepot of the trade. Subsequent to this an adventurer, by the name of Mr. Thomas Curry, having penetrated to the furthest limits of the French discoveries in the fur country, and returned with a successful cargo; numerous persons were encouraged to embark their capital, and engage in the concern, and they, or their agents, began to spread over every part of the country, particularly where the French settlements had previously been established. The trade was now pursued with such avidity and irregularity, that in a few years it became the reverse of what it ought to have been, for the benefit of the persons concerned. An animated competition prevailed, and the contending parties carried the trade beyond the line of demarcation laid down by the French, though with little advantage to themselves, and to the serious injury of their neighbours, the Hudson's bay company, who, in the year 1774, and not till then, thought proper to move their depot and factory to the east bank of Sturgeon lake, in latitude 53° 56 north, and longitude 102° 15′ west. Roused from torpidity, they now evinced more jealousy towards their fellow subjects, and perhaps with greater reason than they had ever done towards those of France. This competition, and many other incidental circumstances, for some considerable time, injured the Canadian trade; and which, by the irregular mode it was conducted, yearly grew worse and worse. About this time that direful malady, the small-pox, raged with uncommon virulence among the Indian tribes, and as Mr. Mackenzie describes it, "the fatal infection spread around with a baneful rapidity which no flight could escape, and with a fatal effect that nothing could resist, spreading its destructive and desolating power as the fire consumes the parched grass." These combined circumstances reduced the fur trade of Canada to a forlorn condition. During the winter of 1783—4, the Canadian merchants engaged in this concern formed a junction of interests, under the name of the North-west Company; who divided their firm, for capital they had none, into sixteen shares; each partner furnishing a proportionate quota of such articles as were necessary for carrying on the Indian intercourse. The traders in the country, forgetting their former animosities, and with the expectation of having their labours adequately rewarded, entered into a co-partnership with the merchants of Montreal, engaging with the utmost spirit and activity to further the general interest. The trade, thus consolidated, was directed by able men, who, from the powers with which they were entrusted, were enabled to carry it on to the utmost capable extent. In the year 1787, this company was joined by a rival company, which had started soon after the first was formed, and in which Mr. Alexander Mackenzie, the author of "Voyages from Montreal, &c." bore a distinguished part. This commercial establishment was, by union of ability, and local knowledge, founded on a more solid basis than hitherto had been known in the country; and it not only continued in full force, vigour, and prosperity, in defiance of all interference from Canada, but maintained at least an equal share of advantage with the Hudson's bay company, notwithstanding the decided superiority of their local situation. This new, or combined North-west company, consisted of twenty sharers; of these, some were called the company's agents, and managed the concerns in Canada. Two went annually to the Grande Portage to transact the business there; while others were obliged to winter among the Indians, and to conduct the intercourse with the respective tribes. By such wise commercial arrangements, and prudent minor regulations, did the self-created company insure its subsequent success. In the year 1788, the gross amount of the annual adventure did not exceed forty thousand pounds, which might be considered at that time the *stock* of the company; but by the exertion and enterprize of the proprietors, it was brought in the space of eleven years to upwards triple that amount; yielding proportionate profits, and surpassing every thing in this department of commerce ever before witnessed in America. Such a prosperous state of affairs induced others to embark in similar undertakings. In 1798 the concern underwent a change, the shares were increased to forty-six. This produced the termination of the company, which was not renewed by all the parties previously concerned, the majority continuing to act under the old firm, and the rest setting up another, under the name of the South-west company; a title the establishment assumed from the circumstance of the furs in which they trade being brought from the Indian settlements in the western parts of America, in the vicinity of the rivers Ohio, Missouri, and Mississippi. This trade had been carried on individually by the persons forming this company, who, by interfering in each other's concerns, did themselves a deal of injury which is now avoided by their union. But it yet remains

remains to be decided, whether two parties under the fame regulations, and by fimilar exertions, though unequal in number, will be able to continue carrying on the bufinefs to a fuccefsful iffue. The contrary opinion has been entertained by many, which, if verified, will make it the intereft of the parties again to coalefce; for neither appears deficient in capital, to fupport their refpective claims on a market, and it is not probable that either will relinquifh them on any other terms, than perpetual participation.

Thefe two companies have nearly monopolized the fur-trade, for having fcarcely any competitors, they have in a great meafure the Indian market in their own power; but they are obliged to pay latterly an advanced price for their fkins and furs; becaufe the Indians, fo long accuftomed to the trade, have long fince learned, that a beaver fkin is worth more than a two-penny knife, or a fix-penny trinket.

By the printed documents of the annual importations from Canada, the quantity of furs and fkins, which arrived in England in the year 1783, was as follows: "96,000 parchment beaver; 3000 coat ditto; 105,000 deer in the hair and fhaved; 10,000 ditto Indian; half-dreffed, 85,000; 10,500 bear; 17,700 otter; 3400 fifher; 40,000 marten; 5600 wolf; 300 woolverin; 7300 cat; 6400 mink; 3900 fox; 3600 elk; 65,000 mufquafh."

After the north-weft company had been formed, how very confiderably the trade was increafed by their united exertions, will appear from the imports of 1784, *viz.* "116,000 parchment beaver; 4000 coat ditto; 130,000 raccoon; 40,000 marten; 19,000 otter; 11,000 bear; 7000 wolf; 8000 cat; 8000 mink; 6000 fox; 4000 fifher; 300 woolverin; 6000 elk; 160,000 deer in the hair and fhaved; 5000 Indian ditto half-dreffed; 84,000 mufquafh."

Subfequent to the junction of the two rival companies in 1788, the trade was ftill further extended, and a much larger quantity of furs were brought into the Englifh market. The invoices of the cargoes belonging to fundry fhips, which arrived from Canada in the year 1791, give the following refult, and it forms the greateft annual importation ever made from that country, *viz.* "168,000 parchment beaver fkins; 5500 coat ditto; 178,000 raccoon; 37,000 marten; 22,500 otter; 15,600 bear; 9600 wolf; 9400 cat; 21,000 mink; 11,000 fox; 600 fifher; 650 woolverin; 147 mufquafh; 86,000 deer in the hair and fhaved; 1000 ditto half-dreffed; 2000 elk." The two enfuing years were nearly as productive; but after the diffolution of the company, and the partial reformation of a fimilar firm, the annual imports began to decline. Thus the import of 1799 gives the following ftatement, *viz.* "113,000 parchment beaver fkins; 1200 coat ditto; 126,000 raccoon; 34,500 marten; 16,000 otter; 21,000 bear; 5900 wolf; 12,500 cat; 8000 mink; 7800 fox; 5400 fifher; 780 woolverin; 6000 mufquafh; 160,000 deer in the hair and fhaved; 1000 elk." From this period, though the quantity imported in one or two years exceeded that of 1799; yet the average arrivals have fallen fhort of it. Thus the report of 1803 gives, "93,000 parchment beaver fkins; 200 coat ditto; 150,000 raccoon; 32,000 marten; 17,000 otter; 25,000 bear; 5600 wolf; 14,000 cat; 12,000 mink; 10,000 fox and kitt; 57,000 fifher; 1400 woolverin; 76,000 mufquafh; 204,000 deer in the hair and fhaved; 600 elk." The year following produced rather more, and the fucceeding one much lefs. The refult of 1807 will ferve to give a general view of the prefent ftate of the trade: "106,000 parchment beaver fkins; 125,000 raccoon; 54,000 marten; 12,000 otter; 16,000 bear; 1000 wolf; 5,300 cat; 15,000 mink; 10,000 fox. N.B. 2300 white; 7000 fifher; 200 woolverin; 15,500 mufquafh; 216,000 deer in the hair and fhaved; 800 elk."

What have been the caufes of this gradual diminution in the quantity brought to market has been a fubject of ferious inquiry. By fome it has been attributed to the interference of the Hudfon's bay company; and their agents, engroffing a confiderable portion of the intercourfe with the Knifteneaux, Chepewyan, and other tribes of Indians, who ufed exclufively to trade with the Canadian adventurers. But by reverting to the ftate of the fales belonging to that company, it will be evident this could not have been the caufe, for the arrivals in the market through that channel alfo have been progreffively growing lefs. Two reafons may be affigned for the defalcation. Firft, the diftance the adventurers are obliged to go to meet with new Indian tribes for the purpofe of profitable barter, and the expenfive range the hunters are neceffitated to take, for fuccefsful purfuit in procuring faleable fkins. A fecond reafon may be found in the recent formation of a new company at New York for carrying on the fur-trade in the United States; who, though at prefent they do not much annoy the Canadian traders by their rivalfhip in the commerce of the extenfive lakes; yet by the quantity of furs they import from Canada, for the purpofe of fupplying the Chinefe, they occafion a confiderable drawback on the quantity of goods which otherwife would be expofed in the Englifh market. Thefe two co-operating caufes have had a confiderable influence, both upon the trade in Canada, and alfo at Hudfon's bay; and they furnifh two powerfully perfuafive arguments, why the intercourfe fhould be extended and improved with the countries bordering on the north-weft coaft of America.

The prices of this article have been progreffively rifing, not merely, as ftated by fome, on account of the lefs quantity brought into the market; but from more powerful though lefs obvious caufes. The competition, which has tended to enhance the value, has arifen from a different quarter. Luxury ramifying and increafing through all ranks and gradations of fociety, has been the primary and continuative caufe of the average advance in the price of furs. Other incidental caufes may have occafioned temporary fluctuations; but thefe foon ceafing to operate, the trade reverted to its ufual level. The leading and grand caufe is, that change that has taken place in the national manners of this country; which is technically couched under "the nature of the trade." To inftance, refpecting beaver, where fome years fince one perfon wore a hat fabricated from that fpecies of fur, a thoufand probably do at prefent. Formerly muffs, tippets, and furred garments were only worn by people of quality, or diftinguifhed the upper claffes of gentry. Now coftly furs adorn the drefs of females in that fphere of life, in which perfons at no remote period were ufually clad in the plaineft and moft homely attire. To this may be added the expence of freight, infurance, &c., owing to a protracted war. And the indirect influence of general taxation, as well as the effects of a direct impoft, and an additional fifteen per cent. lately put upon the article, fubjects the confumer to an accumulated charge. It is not requifite to enter into details minutely to inveftigate the fcale of gradation, or mark the different periods of advance; fuffice it to obferve, that by the fale prices of the Hudfon's bay company, on an average of eleven years from 1722 to 1733 inclufive, the price of beaver, which to a certain extent regulates the reft, fold from three fhillings and three-pence to feven fhillings and fix-pence per pound, forming a medium of five fhillings and four-pence halfpenny. By the accounts laid before parliament in 1749, the average price, reckoning for ten years prior to that period, of a pound weight of beaver, was

fix

six shillings and three halfpence. Since that time it has variously fluctuated, but still kept progressively rising; till at one time it had advanced to the enormous height of thirty shillings per pound. It then fell considerably, and at present maintains the average rate of *twenty-four*. Mr. Gray, who in his account of Canada frequently alludes to the fur trade, furnishes a few remarks, calculated to illustrate this subject; for by contrasting the prices at the London sales with those of Canada, which he gives in his statement, it will be seen, that not monopoly, but the increasing demand in the market, and the difficulty of supplying it, have been the actual causes of the advance in price.

The following were the quantity, kinds, and prices of furs and peltry exported from Canada to Britain, on an average of three years ending 1805, *viz.*

			£.	s.	d.
Beaver skins	99,076	average weight each $1\frac{1}{3}$lb. at 14*s.* per lb.	92,470	18	8
Marten	21,370	at 4*s.* each	4,634	0	0
Otter	17,649	— 17*s.* 6*d*	33,091	17	6
Mink	11,687	— 2*s.* 6*d.*	1,460	17	6
Fisher	5,657	— 8*s.* 6*d.*	2,404	4	6
Fox	8,636	— 12*s.*	5,181	12	0
Bear and cub	20,074	— 40*s.*	40,148	0	0
Deer	223,290	— 5*s.*	55,822	10	0
Raccoon	151,710	— 2*s.*	15,171	0	0
Muskwash	79,650	— 1*s.* 2*d.*	4,646	5	0
Cat, cased and open	12,221	— 7*s.* 6*d.*	4,582	7	6
Wolf	6,425	— 8*s.*	2,570	0	0
Elk	1,032	— 10*s.*	516	0	0
Woolverin	1,250	— 5*s.*	812	10	0
Hare, Rabbit, Ermine, Squirrel	3,062	— 8*d.*	76	11	0
		Total in value	£ 263,088	13	8

Exclusive of this part of the trade, a large quantity of furs of all descriptions are annually sent by way of St. John's into the United States; not merely for supplying the demands of that country, but for exporting to China, for which market the finest furs and prime peltries are in request. The amount of these articles sold to the Americans in the year 1806, Mr. Gray states at 62,009*l.* 15*s.* 2*d.* The reason of the furs being sent by this channel, rather than through the London market, is the difficulty of getting home the produce obtained for the furs in China by the East India company's ships, together with the various restrictions laid by the directors, and the heavy duty payable on the exportation.

Mr. Gray's account of the exports of furs and peltries from Quebec in 1808, is as follows, *viz.*

				£	s.	d.
Beaver	126,927	at	18*s.* 9*d.*	118,994	1	3
Marten	9,530	—	3*s.* 4*d.*	1,588	6	8
Otters	7,230	—	20*s.*	7,230	0	0
Mink	9,108	—	2*s.*	910	16	0
Fishers	3,866	—	4*s.*	773	4	0
Foxes	1,038	—	5*s.*	259	10	0
Bears and cubs	1,298	—	25*s.*	1,622	10	0
Deers	103,875	—	3*s.* 4*d.*	17,312	10	0
Cased and open cat	5,718	—	3*s.* 4*d.*	953	0	0
Raccoons	123,307	—	2*s.*	12,330	14	0
Musk cats	6,513	—	1*s.* 6*d.*	488	9	6
Wolf	18	—	7*s.* 6*d.*	6	15	0
Elk	662	—	15*s.*	496	10	0
Woolverins	39	—	5*s.*	9	15	0
Seals	10	—	4*s.*	2	0	0
Buffalo	1	—	20*s.*	1	0	0
			Total value	162,979	1	5

By this statement it will appear that the fur trade to Britain has recently declined; and that many of the articles have sold at a reduced price, compared with the average amount and prices in 1805.

The Canadian imports, for the year 1808, consisted of 92,000 parchment beaver; 3000 coat ditto; 123,000 raccoon; 10,000 marten; 7000 otter; 1300 bear; —— wolf; 5700 cat; 9000 mink; 1000 fox; 3900 fisher; —— woolverin; 5400 muskwash; 103 deer, in the hair and shaved; 600 elk. The highest price obtained for parchment beaver was twenty-one shillings, the average twenty; cub ditto, twenty-five, average ditto twenty-three and six-pence; coat ditto, fourteen and five-pence, average ditto eleven and ten-pence. By comparing this statement with the one previously given from the sale-report of the Hudson's bay company, for the same year, it will appear, that notwithstanding the gradual defalcation in the quantity of furs brought from Canada, yet the importation from that country is nearly treble the amount of that from Hudson's bay; and that the price of coat-beaver from the former country is considerably lower than what is brought from the latter, while the cub and prime parchment beaver reaches a higher standard. This difference can only arise from the quality of the respective articles, since the sales are conducted on a similar plan, *viz.* "by the candle at a public auction." To explain the general mode of carrying on the fur trade, and conducting the necessary interchange of commodities with the Indians, it will be necessary to have recourse to the details given on this subject by that intelligent merchant and observant traveller, Alexander Mackenzie, whose voyages of discovery in the interior, indefatigable labours for the furtherance of this branch of commerce, and the prosperity of our northern states in America, deserve the highest encomium; and doubtless his fame, with his valuable works, will descend to the latest posterity. The facts which those afford will be interspersed with others furnished by Hearne, Vancouver, Gray, &c. &c.

with fuch additional remarks as may tend to the elucidation of the fubject.

The commercial relations with the Indians form purely a barter trade, as money is of little value in a country where every thing bought and fold is, and muft be, in kind. The articles neceffary for the trade are, coarfe woollen cloths of various kinds, milled blankets of different fizes; arms and ammunition; twift and carrot tobacco; divers forts of Manchefter goods; linens and coarfe fheetings; threads, line, and twine; common hardware; cutlery and ironmongery of feveral defcriptions; brafs and copper kettles; fheet iron; filk, and cotton handkerchiefs; hats, fhoes, and hofe; calicoes, printed cottons, &c. &c. Thefe are imported from England. Spirituous liquors, and divers articles of provifion, are purchafed for the concern in Canada. Thefe goods are previoufly made up, and properly prepared for the Indian market at Montreal. The expence of this, the tranfporting them to the Indian territory, and freighting back the goods obtained in exchange, including wages to clerks, interpreters, guides, and canoe men, conftitute about half the annual amount againft what is termed *the adventure*. Thefe are conveyed by bateaux, flat-bottomed boats, and canoes, which commence their voyage at La Chine, about nine miles above Montreal, the rapids in the river St. Lawrence preventing the working up loaded canoes between thofe two places. Some proceed by way of lakes Ontario and Niagara, &c.: but the greater number by the river Altawa, or Outawais, and by other rivers and portages, to lake Nipiffing, lake Huron, lake Superior, and thence by feveral chains of large and fmall lakes and rivers to lake Winipey, Athabafca, or Arathapefcow lake, and the great Slave lake, which is within a few hundred miles of the weftern coaft of North America. In this range of their trade the company have at times from one to two thoufand people in their employment, as their agents and fervants, at their numerous pofts, difperfed over the country, who conduct the bufinefs and cultivate the friendfhip of the Indians, among whom fome of them conftantly refide. At one particular period Mr. Mackenzie thus particularly ftates the number of men employed in the concern by the North-weft company. "Fifty clerks, feventy-one interpreters and clerks, one thoufand one hundred and twenty canoe men, and thirty-five guides. Of thefe, five clerks, eighteen guides, and three hundred and fifty canoe men were engaged for the fummer feafon in going from Montreal to the Grande Portage in canoes; part of whom proceeded from thence to Rainy lake. Thefe, which are called porkeaters, or goers and comers, and hired in Canada or Montreal, were abfent from the firft of May till the latter end of September. For this trip the guides had from eight hundred to a thoufand livres, and a fuitable equipment; the foreman and fteerfman from four to fix hundred livres; the middle men from two hundred and fifty to three hundred and fifty livres, with an equipment of one blanket, one fhirt, and one pair of trowfers, and were maintained during the voyage at the expence of their employers. Independent of wages, they were allowed to traffic, and many of them earned to an equal amount. About one-third of thefe proceeded to winter, and had more than double the above allowance and equipment. All the reft were hired by the year, and in fome inftances for three years. Of the clerks, many of them were apprentices, who were generally engaged for five or feven years, for which they had only one hundred pounds, with provifion and clothing."

The neceffary number of canoes having been purchafed, at three hundred livres each, the goods formed into packages, of about eighty or ninety pounds weight, and the lakes, with their connecting rivers, free of ice, which generally happens by the beginning of May, the voyagers, with their veffels and cargoes, are difpatched from La Chine. Eight or ten men are appointed to each canoe, and their baggage, provifions, ftores, with other neceffary articles, and fixty-five packages of goods, are ftowed into this fmall veffel. "An European, on feeing one of thefe flender veffels, (fays Mr. Mackenzie,) thus laden, heaped up, and funk with her gun-wale within fix inches of the water, would think his fate inevitable in fuch a boat, when he reflected on the nature of her voyage; but the Canadians are fo expert, that few accidents happen." The canoe is conftructed with much ingenuity, it is perfectly light, and by that means anfwers remarkably well the purpofes for which it is intended. The length of thofe canoes, which are ufed in the fur trade, is about thirty feet, the greateft breadth fix, gradually narrowing towards each end, till they terminate in a point; the bottom is rounded, and they have no keel. A frame is formed of flight pieces of light wood, over which is faftened a fheathing, compofed of fections of bark, taken from the birch tree; thefe are fewed together with filaments from roots of the fpruce fir tree called *watape*; and the calking, or making the feams water-tight, is effected by a fpecies of gum which hardens and adheres more firmly in the water. "I had the pleafure, (obferves Mr. Gray,) of feeing both an arrival, and departure of canoes from, and to, the north-weft territories. It certainly is a curious fpectacle. The canoes, when they take their departure from La Chine, are loaded to within about fix inches of the gun-wale, or edge of the canoe. Inftead of oars, they ufe paddles, which they handle with great dexterity. They ftrike off, finging a fong peculiar to themfelves, called the "voyager's fong;" one man takes the lead, and all the others join in a chorus. It is extremely pleafing to fee people, who are toiling hard, difplay fuch marks of good humour and contentment, although they know, that for a fpace of more than two thoufand miles, their exertions muft be unremitting, and their living very poor; for, in the little fpace allowed in the canoe for provifions, you find none of the luxuries, and a very fcanty fupply of the neceffaries of life. The fong is of great ufe; they keep time with their paddles to its meafured cadence, and, by uniting their force, increafe its effect confiderably."

Leaving La Chine they proceed to St. Anne's, within two miles of the weftern extremity, in the ifland of Montreal, on the lake of the two mountains, which is confidered the commencement of the Utawas or Outawais river, and prefents itfelf to the voyagers; who, to pafs the rapids of St. Anne, are obliged to take out part, if not the whole, of their lading. From this fpot they confider their departure, becaufe near it ftands the laft church on the ifland, dedicated to their tutelar faint. The lake of the two mountains is about twenty miles long, and contracting its waters forms the river Utawas, whofe navigation is interrupted, at intervals, by a variety of cafcades and rapids, that either render decharges, or portages neceffary. By the former are meant places where the canoes muft unload their cargoes, and the packages be carried over to points, where the river again deepens, and becomes fit for navigation; and by the latter, fuch places where the obftacles oblige the voyagers to carry over both canoes and cargoes. Thus they proceed to lake Nepifingui, from which by French river, in latitude north 45° 53', they enter lake Huron. Hence paffing the ifland of Michilimakinac, at the confluence of lakes Huron and Michigan, and paffing along the north fhore of the former, they portage over the falls of the river St. Mary, which

which extends to lake Superior; and having croffed that immenfe body of water which forms the grand refervoir of the river St. Lawrence, they arrive at the important entrepot denominated the Grande Portage. At this place they are met by the northmen, who generally come down about the beginning of July. At this period it becomes neceffary to felect from the pork-eaters a number of men, among whom are alfo the recruits, or volunteer winterers, fufficient to man the canoes neceffary for carrying the goods and provifions requifite for the Athabafca country, to the river of the Rainy lake. The northmen, who have arrived at Grande Portage, are regaled, have their accounts fettled, and fuch as choofe to fend any of their earnings to Canada receive draughts to remit the fame to their relations. Such as have not previoufly entered into engagements during the winter, as is cuftomary, now contract for returning up the country, to perform the annual voyage for one, two, or three years; and as foon as every thing can be got ready, which ufually requires a fortnight, they are again difpatched to their refpective departments. This done, the agents, affifted by their clerks, prepare to return eaftward, by getting the furs and fkins acrofs the Portage, and re-packing them in bales of one hundred pounds each, to fend them down to Montreal, where they commonly arrive about the month of September.

The trade from the Grand Portage to the interior is, in fome particulars, carried on in a different manner from that between it and Montreal. The canoes employed in the tranfporting goods from the latter place are too large for carrying them beyond the former. Others therefore of about half the fize, navigated by about four to fix men, are here procured from the natives. Thefe boats carry, on the average, about thirty-five packages, in which twenty-three are for the purpofes of trade, and the reft are ufed for provifions, ftores, and baggage. A pilot, or conductor, is appointed to every four or fix of thefe canoes, and thus loaded, the voyagers embark on the river Autort, on the north fide of the Portage. Thence proceeding to lake Outard, they enter the Mountain lake, pafs by numerous portages to lakes Rofe, Saginaga, De la Pluie, and De Bois, which contracts into the river Winipic. The courfe is now through various fmall lakes and rivers, with numerous intervening portages and decharges to the laft, at the great waters of lake Winipic; between which, and Hudfon's bay, two communications are formed by means of the Severn and port Nelfon rivers. Several other rivers difcharge their waters into this lake, *viz.* the Dauphin, Red-deer, and Safkatchiwine: and the whole country, to the fouth of the latter, abounds in beaver, moofe-deer, fallow-deer, elks, bears, buffaloes, and numerous other animals, calculated to the trade in furs and peltry. On thefe waters are three principal forts, for the protection of thofe conducting the concerns. Fort Dauphin, erected by the French, prior to the conqueft; Red-deer, and Swan-river forts, with feveral fmall detached outpofts belonging to each. Up the Safkatchiwine the flotilla of canoes proceeds to Cedar lake, from whence the abovementioned river is navigable to near its fource. On this fine communication are five principal factories; *viz.* Nepawi-houfe, South-branch-houfe, Fort George-houfe, Fort Auguftus-houfe, and Upper Eftablifhment. Leaving the Safkatchiwine, the voyagers enter the river that communicates with the Sturgeon lake, on the eaftern bank of which is fituated another factory, Cumberland-houfe. Thence the rout lies through Pine-ifland lake, lake de Bouleau, Miron lake, lake de Bois, to the Miffinipi, called alfo Churchill river. The inhabitants of this part of the country are the Kniftenaux Indians, whofe furs the traders for feveral years fucceeded in obtaining till 1793; when the fervants of the Hudfon's bay company thought proper to fend their people amongft them, for the purpofe of fecuring their credits, which the natives are apt to forget, and advancing towards the interior by a new line of commercial fpeculation. Why they had not adopted fuch a meafure long previous to this period is not very obvious: for it muft have been, as the fact has fince proved, highly beneficial to their concerns. From the fhort diftance they had to come, the quantity of goods they were able readily to fupply, the trade, as experience has evinced, muft have reverted to them: the Canadian merchants being unable, from the remotenefs of their fituation, and other circumftances, to meet the company's agents upon adequate terms.

The courfe of this river is interrupted by rapids and falls, and the flotilla has yet to pafs by feveral fmall lakes and rivers to Otter lake; thence by lakes de l'Ifle d'Ours, lake des Souris, lake du Serpent, lake Croche, lake Shagoina, lake la Croife, lake de Bœuf, up the river la Loche, and thence by the Elk, which communicates with the lake of the Hills, in latitude 58° 36′ north. On the fouthern fide of this is fituated what is termed the "Old Eftablifhment," which was the only one in this part prior to the year 1785. It was formed by a Mr. Pond in 1778—9, about forty miles diftant; and transferred to this place in 1788, by the order of the north-weft united company. This, called Fort Chepewyan, is in latitude 58° 38′ north, and longitude 110° 26′ weft. This was the fettlement where Mr. Mackenzie refided eight years, conducting the concerns of the north-weft company, whence he took his departure on both his expeditions of difcovery; and the furtheft to the north-weft hitherto eftablifhed for carrying on the commerce in furs and peltry. The following is the ftatement he gives of the mode adopted in tranfacting the bufinefs. "The flotilla of laden canoes, which leave lake de Pluie about the firft of Auguft, do not arrive here till the latter end of September, or the beginning of October, when a neceffary proportion of the number is difpatched up the Peace river, to trade with the Beaver and Rocky Mountain Indians. Others are fent to the Slave river and lake, to traffic with the inhabitants of that country. A fmall part of them, if not left at the fork of the Elk river, return thither for communicating with the Kniftenaux; while the reft of the people and merchandize remain here to trade with the Chepewyans. In the fall of the year, the natives meet the traders at the fort, where they barter the furs or provifions which they have procured, then obtain frefh credit, proceed to hunt the beavers, and do not return till the beginning of the year; when they are again fitted out in the fame manner, and come back the latter end of March, or the beginning of April. But they are now unwilling to repair to the beaver hunt until the waters are clear of ice, that they may kill them with fire-arms, which the Chepewyans are averfe to employ. The major part of the latter return to the barren grounds, and live during the fummer with their relations and friends in the enjoyment of that plenty which is derived from numerous herds of deer. Yet perfons of that tribe who are moft partial to thofe defarts cannot remain there in winter, and they are obliged, with the deer, to take fhelter in the woods in that rigorous feafon, during which they contrive to kill a few beavers, and fend them by young men, to exchange for iron utenfils and ammunition. Till the year 1782 the people of Athabafca fent or carried their furs regularly to fort Churchill, Hudfon's bay, and fome of them have fince that time repaired thither, notwithftanding they could have provided themfelves from the Canadians with all the neceffaries which they required. The difference of the price fet on

 goods;

goods, here and at that factory, made it an object with the Chepewyans to undertake a journey of five or ſix months, in the courſe of which they were reduced to the moſt painful extremities, and often loſt their lives from hunger and fatigue. At preſent, however, this traffic is in a great meaſure diſcontinued, as they were obliged to expend, in the courſe of their journey, that very ammunition which formed its moſt alluring object." Such is the ſubſtance of the communications of the moſt intelligent writers upon this intereſting ſubject, ſeveral of whom were ably qualified to give it elucidation from having had ocular demonſtration of the facts they relate. But none of them attempt to detail the particular mode of intercourſe with the Indians, or the ratio of exchange or barter between them and the traders. This, which will be regretted by all who have read the very important information contained in their works, particularly in Mr. Mackenzie's voyages, may be accounted for thus: the writers were perſons intereſted in the trade, the lucrative returns of which formed a ſtrong inducement to give general information rather than narrate particular circumſtances, that, if developed, might have led to an injurious competition. Some idea, however, of the agio, or rate of exchange, as well as the manner of effecting it, has already been given in the account of the commercial relations between the Indians and the Hudſon's bay company. A further elucidation may be found in the following ſtatement, which, as a maximum fixed by government for the benefit of both parties, though occaſionally departed from, probably conſtitutes a general guidance or regulation for the trade.

In the year 1762 the governor of Nova Scotia, having conciliated the friendſhip of the neighbouring Indians, who had been converted to the religion and intereſts of the French, an act was paſſed by the provincial legiſlature to guard againſt the interruption of the provincial harmony, by fraudulent practices in perſons who trade with the Indians; and to oblige all ſuch to take out licences, and give ſecurity for their compliance with the regulations of the act. The ſtatute moreover eſtabliſhed a tariff of regulated prices, which were fixed as the ſtandard of the trading intercourſe between the white people and the Indians.

A pound of the beſt ſpring beaver, valued at 5*l.* was eſtabliſhed as the fixed ſtandard, by which all other goods were to be eſtimated, *viz.*

1¼ Of fall beaver	To be conſidered equivalent to 1lb. of ſpring beaver.
1 Otter ſkin	
3 Sable or marten ſkins	
6 Mink ſkins	
13 Muſk rats, or muſquaſh ſkins	
5lb. Of deer ſkins	
10 Ermine ſkins	

1 Large good bear ſkin equal to	1 lb.	of ſpring beaver
1 Red fox ſkin - - -	½	——
1 Black fox ſkin - - -	2	——
1 Silver fox ſkin - - -	2½	——
1 Large mooſe ſkin - -	1½	——
1 Large cat ſkin, loup ſervie - -	2	——
Seal ſkins, according to ſize, from 8*d.* to 3*s.* and 4*d.*		
6lb. Of feathers - - -	1lb.	of ſpring beaver.
1 Large blanket - - -	2	——
Rum, per gallon, - -	⅓	——
Molaſſes, per gallon - -	⅖	——
30lb. Of flour - - -	1	——
14lb. Of pork - - -	1	——
Stroud, per yard - -	1½	——

And all other merchandize in proportion to theſe rates. From this, and preceding ſtatements, it will readily occur to the reader, that the profits of the fur trade are very large; and ſo they reaſonably ought to be, for the capital employed is great, and the returns peculiarly tardy. The agents are obliged to order neceſſary goods from England in the month of October, eighteen months before they can leave Montreal; that is, they are not ſhipped from London until the ſpring following, when they arrive in Canada during the ſummer. In the courſe of the following autumn they are made up into ſuch articles as are required for the Indians; they are then packed into parcels of eighty or ninety pounds each, but cannot be ſent from Montreal until the enſuing May; ſo that they do not get to market before the winter following, when they are exchanged for furs, which arrive at Montreal the next autumn, and from thence are ſhipped, to London chiefly, where they are not ſold, or at leaſt paid for, till the ſucceeding ſpring, or even as late as the month of June. Thus payment is made forty-two months from the time the goods were ordered in Canada; thirty-ſix after they had been ſhipped from England, and twenty-four ſubſequent to their having been forwarded from Montreal. So that from the time the goods have been bartered for furs, and theſe arrive in London, are ſold, and remittances made, full three years have elapſed. Conſequently, the merchant, allowing he has twelve months credit, does not receive his returns, to pay for thoſe goods, and anſwer the neceſſary attendant expences in procuring them, which are about equal to the value of the goods, till two years after they are conſidered as caſh, which renders this a very heavy buſineſs; the profits ought therefore to be at leaſt triple the profits of a trade where the capital is turned once a year.

The fur trade to the Canadians is nearly as valuable as their corn trade; it employs a great number of people, and a large capital. Beſides the expenditure it occaſions in Canada, the concern ultimately tends to the encouragement of Britiſh manufactures, for thoſe who are employed in the different branches of this buſineſs are enabled by their gains to purchaſe Britiſh articles, of which they otherwiſe muſt forego the uſe. The duty paid in England on furs and ſkins imported from Canada amounted, on an average of four years, ending 1806, to 22,053 *l.* per annum. And further, we not only gain by thus being almoſt excluſively poſſeſſed of the commerce in furs and peltry, but alſo by the articles taken in exchange, which, it has been ſeen, are coarſe woollens, iron-ware, copper, and braſs utenſils, fire-arms, gun-powder, ſhot, and other manufactured articles. It has been pregnant with ſtill more general benefits, both to the important objects of ſcience and commerce; for the one has had new regions developed to its ken, by the reiterated exertions to extend the other. Thus what is generally conſidered, and in too many inſtances has been, congenial to the attainment of geographical information, in the preſent caſe has been productive of the moſt happy diſcoveries. Our Indian traders and wood rangers have explored ſeveral unknown countries, and found many nations and tribes to traffic with, far back in the interior of that vaſt continent, till at length they have penetrated to the great weſtern Pacific ocean, and opened a new way of intercourſe with Japan and China. It has developed more, for it has ſet at reſt for ever that long agitated, and juſtly deemed intereſting queſtion, reſpecting the exiſtence of a north-weſt paſſage, or communication by ſea, between the Atlantic and Pacific oceans. Mr. Hearne, a naval officer, but then in the ſervice of the Hudſon's bay company, in conſequence of ſome information received from the Indians, was ſent by the governor of Fort Prince-of-Wales on a journey of diſcovery in the year 1770. Having penetrated to the Frozen ocean at the mouth of the Copper-mine river, which by his ſtatement lies in nearly 72° north latitude, he

 learned

learned from converfation with the Indians, that the continent ftretches away from thence a prodigious way to the weftward. By this journey it was afcertained that any communication between the Atlantic and Pacific, if exifting, muft be beyond that high latitude. But fince the conqueft of Canada, more has been done in this way by a few fpirited merchants, than had been effected for two centuries by the Hudfon's bay company, although their charter was principally, as it oftenfibly ftates, granted for that important purpofe. The North-weft company of Montreal, having been informed by one of their remoteft agents, that the Indians had told him of a river flowing into a fea, which was at no great diftance to the northward; Mr. Mackenzie, one of the partners, left Montreal in the beginning of the fummer of the year 1789, purpofely to afcertain the veracity of a communication fo interefting to fcience and commerce. Attended by a few Indians, he traverfed partly in canoes, and partly by walking, the great extent of wildernefs in which their pofts are eftablifhed, and proceeded beyond them down a confiderable river, running north, till he actually arrived at the Frozen ocean, in which he faw fome fmall whales among fields of ice, and obferved the rife and fall of the tide. On an ifland, to which he gave the name of Whale-ifland, at the mouth of the river, to which alfo he affixed his own, he erected a poft, near a few old deferted huts, engraved on it his name, the number of perfons with him, the time they remained, and the latitude of the place, which was found by obfervation, 69° 14′ north. This voyage, or journey of difcovery, and alfo that of Mr. Hearne's previoufly noticed, having developed the unfrequented regions of America, muft be fufficient to prove the utter impoffibility of a navigable communication exifting in any temperate part of that continent; and we might reafonably expect to have no more conjectures or fpeculations upon that fubject, more efpecially fince the voyage of captain Vancouver in 1792, 3, and 4, who made a furvey of the whole north-weftern coaft of America, from latitude 39° 27′, north as far as the inlet, called Cook's river, and Prince William's found. Upon a very careful and minute infpection of every creek and inlet of a coaft, confifting entirely of creeks and channels, formed by an innumerable multitude of iflands, he was enabled pofitively to afcertain that there is no navigable paffage between the Pacific and Atlantic oceans; unlefs there may be a poffibility of failing through the generally frozen ftrait between Afia and America, and navigating the polar ocean, which bounds the unknown extremity of the latter continent. Mr. Mackenzie, in 1793, fet out on another inland voyage of geographical and commercial difcovery. In this fecond expedition he directed his courfe to the weftward, and after paffing the higheft land, and walking above 100 miles, he and his party re-embarked on a river running weft, and plentifully ftocked with excellent falmon, which conveyed them to an inlet of the Pacific ocean, where they faw porpufes and fea-otters, and obferved a confiderable rife and fall of the tide. There, at a place previoufly denominated Cafcade Canal, by captain Vancouver, he painted upon a rock the words "Alexander Mackenzie from Canada by land, 22d July 1793." From thefe difcoveries, and the fact having been afcertained, that there exifts no practicable north-weft paffage by fea between Afia and America, the practicability of a different kind of communication becomes an object of important confideration. The Ruffians, who firft difcovered, that along the coafts of Afia no ufeful and regular navigation exifted, opened an interior intercourfe by rivers and lakes, through that long and widely extended continent to the ftrait feparating Afia from America, over which they paffed to the territories of the latter. From this Mr. Mackenzie infers, that fince the non-exiftence of a practicable paffage by fea, and the exiftence of one through the continent have been proved, the fituation of our North American fettlers has become nearly fimilar to that of Ruffia.

The trade in furs and peltry experience has proved, from its nature, cannot be advantageoufly carried on by individuals, for as a very large capital, credit, or both is neceffary to conduct the concern with any profpect of fuccefs, it confequently follows, as an effential point, that an affociation of men fhould be formed, fome of wealth to direct, and others of enterprize to execute, and fo to act together in one common intereft, and on fuch principles, that the latter might fucceed the former in continual gradation. The junction of fuch a commercial affociation with the Hudfon's bay company, Mr. M. conceives would be a very important meafure, which, if adopted, the trade might then be purfued with a very fuperior degree of advantage, both in a private and public view, under the privilege of their charter, and would in fact prove the only method of completely fulfilling its ftipulated conditions. He alfo obviates any objections to fuch a plan, by confidering it would be equal injuftice to exclude either party from the option of fuch an undertaking; conceiving, the right the one poffeffes by charter, as counterbalanced in the other cafe by prior poffeffion. And fhould the company be adverfe to fuch an union of interefts, it would be a fair and reafonable propofal, upon a proper indemnification being offered, for government to oblige them to relinquifh a right they refufe to exercife, or to allow others the navigation of the bay to Nelfon's river; by which means the trade might be extended to the head of the Safkatchiwine river, to the mutual advantage of Canada, and of Britain.

He further fuggefts, that by means of Port Nelfon river, which empties itfelf into Hudfon's bay, the Peach river, the Safkatchiwine, that rifes in the rocky mountains, and the Columbia, which has its fource on the weftern fide of the fame; a communication by water might be formed nearly the whole length between the two great oceans, the Pacific and the Atlantic. By opening this intercourfe the Canadian merchants would be enabled to fupply the natives of the interior with a larger quantity of ufeful articles, and at a reduced price. The enhanced value of which, and the difficulty of tranfporting them, will be eafily comprehended, when the attendant circumftances are taken into confideration. The tract of tranfport occupies an extent of land from three to four thoufand miles, through upwards of fixty large lakes, and numerous rivers, and the means of conveyance are flight bark canoes. And thofe waters are interrupted by more than two hundred rapids, along which the articles of merchandize are chiefly carried on men's backs, and over a hundred and thirty carrying places, from twenty-five paces to thirteen miles in length, where the canoes proceed by the fame toilfome and perilous operations. By the route propofed moft of thefe retarding circumftances would be obviated, or greatly diminifhed.

Since the difcoveries on the north-weft coaft of America by captain Cook, one of the numerous advantages refulting from the labours of that enterprizing circumnavigator was, the opening a new and extenfive fource for procuring furs of the moft valuable quality, and a new market for European commodities; the nature of which has been further elucidated by the exploratory voyages of captain Vancouver. By opening, therefore, the intercourfe recommended by Mr. Mackenzie, forming regular eftablifhments through the interior, and at both extremes, as well as along the coaft; the entire command of the fur trade with North America might be

be obtained from 48 degrees of north latitude to the pole, except that portion of territory occupied by the Ruſſians. Such would be the ſpacious field for enterprizing exertion, and incalculable would be its advantages, if ſupported by the influence of credit and capital; means which Great Britain ſo pre-eminently poſſeſſes over other nations. Then would this country begin to receive ſome remuneration for the money it has expended in diſcovering and ſurveying the coaſts of the Pacific ocean, which at preſent are principally left to American adventurers, who, without regular ſyſtem, or adequate means to embark in the concern, and regardleſs of conciliating future confidence, look only to the intereſt of the preſent moment. Theſe having therefore collected all the ſkins they can obtain, and in whatever manner beſt ſuited to their means, proceed with them acroſs the Pacific to Canton, exchange them for the produce of China, and return with their wealth to their own country. Such adventurers, and many of them are very ſucceſsful in their concerns, would ſpeedily diſappear on the eſtabliſhment of a well-regulated trade; and nearly the whole traffic in furs muſt and would circulate through the channels of Britiſh commerce.

Some ſcheme or other, upon a grand ſcale, it is eſſential to adopt, if it be deſirable to preſerve the fur trade in the hands of the Hudſon's Bay and Canadian merchants. For ſince the ſetting up of the New York company, the diſcoveries on the north-weſt coaſt of America, and the finding what a profitable concern the ſale of fur was in the Chineſe and other eaſtern markets, the American merchants have made it an important ſubject of their ſpeculations. For the purpoſe of collecting information, and opening an intercourſe with various Indian tribes, an expedition was undertaken at the expence of the American government, by "a corps of diſcovery," as it was termed, under the command of captains Lewis and Clarke, belonging to the army of the United States. The voyagers, for it was performed greater part of the way in canoes, ſpent the years 1804, 1805, and 1806, in obtaining the object of their purſuit, which was, to find a paſſage by the Miſſouri and Columbia rivers to the Pacific ocean. The intention was fully anſwered by their aſcertaining the exiſtence of ſuch a practicable communication. By this means the people of the United States have obtained a fine clue to the north-weſt Indian tribes, and the river Columbia, with the adjacent bays and creeks, which abound with immenſe numbers of the ſea-otter, an animal that produces the fineſt and moſt valuable fur. Thus have they become poſſeſſed of the power of competition with the inhabitants of the northern ſtates ſubject to Britain; and are likely, if the Canadians ſtill continue to be circumſcribed by the tenacity of the Hudſon's Bay company, to outrival the Britiſh merchants in their own market.

See "Voyages from Montreal on the River St. Laurence, through the Continent of North America to the Frozen and Pacific Oceans, in the Years 1789 and 1793," by Alexander Mackenzie, eſq.; "Annals of Commerce, Manufactures, Fiſheries, and Navigation," by David Macpherſon; "An Account of ſix Years' Reſidence in Hudſon's Bay, from 1733 to 1736, and 1744 to 1747," by Joſeph Robſon; Vancouver's "Voyage round the World;" Gaſs's "Journal of a Voyage up the Miſſouri, &c.;" Umfreville's "State of Hudſon's Bay, and the Fur Trade;" "Letters from Canada, written during the Years 1806, 1807, and 1808," by Hugh Gray; Invoices of cargoes in the ſhips belonging to the Hudſon's Bay company; Invoices of cargoes of the ſhips employed in the fur trade from Canada; and reports of the reſpective ſales.

Fur, in *Heraldry*. See Furr.

Fur, in *Ornithology*, a name given by Bartholine to the Larus *paraſiticus*.

Fur-*ſlice*, in *Agriculture*, a term employed in the northern parts of the iſland to ſignify the long narrow ſlice of earth turned up by the plough. See Furrow-*ſlice*.

FURA, in *Geography*, a ſmall iſland near the weſt coaſt of Scotland; five miles W. of Udrigill Head.—Alſo, a mountain of Africa, in Mocaranga, rich in gold; 30 miles from Maſſapa.

FURAJANNA Soo, a town of Africa, in Fooladoo. N. lat. 13° 16′. W. long. 7°.

FURANS, a river of France, which runs into the Iſere, near Romans.

FURBA, *Valley of*, one of the five diſtricts of the county of Bormio, in Switzerland. See Bormio.

FURBISHER, a perſon who furniſhes or poliſhes arms, and gives them a brightneſs and luſtre.

In the general ſenſe of the word, it includes what we now call armourers and ſword-cutlers; in a more reſtrained ſenſe, it is appropriated to thoſe who clean and ſcour up old ſwords, guns, and halberds, and put them in order.

Among the officers of the Tower there is a furbiſher of ſmall arms, another of ſwords; and the like there is in moſt other armories of England.

FURBISHING, the act of cleaning, ſcouring, and poliſhing arms; as guns, piſtols, ſwords, &c.

The word is formed of the French *fourbiſſure*, which Hicks derives from *furben*, which, in the language of the ancient Franks, ſignified to clean and poliſh: though M. Huet chooſes rather to derive the French *fourbir*, and *fourbiſſure*, from the Engliſh *furbiſh* and *furbiſhing*. Skinner obſerves, that ſome authors derive the Engliſh *furbiſh* from the Latin *furvus* and *fervor*; but for his part, he rather derives it from the German *farb*, colour; and *farben*, to dye, or give a colour.

Furbiſhing is principally performed with emery.

FURCA, Fork, in *Antiquity*, a kind of puniſhment, or rather an inſtrument of puniſhment, among the Romans. The form of the Roman furca is very obſcurely deſcribed by the ancients, and much controverted by the moderns. All we know for certain is, that it was of wood, and reſembled a fork; whence it is called, in writers, ξυλον διπλουν δικρουν διδυμον, that is, *lignum duplex*, *bicornutum*, *geminum*; a double forked, or horned, timber. Plutarch, treating of the furca, ſays, it is originally the piece of timber wherewith the beam of the waggon is upheld: he adds, that it is the ſame with what the Greeks call *apoſtates* and *ſterigma*; and the ſterigma is deſcribed, by Heſychius, as the forked piece of timber put under the yoke of the waggon.

From theſe accounts, Godwyn takes the furca to have been the beam of a waggon, to which the yokes are faſtened.

The puniſhment of the furca was of three kinds; the firſt only *ignominious*, was when a maſter forced his ſervant, for ſmall offences, to carry a furca, or fork, on his ſhoulders, about the city; confeſſing his fault, and warning others to beware of the like: whence ſuch ſervant come to be denominated *furcifer*.

The ſecond kind was *penal*; when the party, having the furca on his neck, was led about the circus, or other place, and whipped all the way.

The third was *capital*; the malefactor having his head faſtened to the furca, and ſo being whipped to death.

In after-times of the empire, when this ſort of puniſhment became interdicted, the form of the furca was changed, and made like our gibbets, or gallows. See Cross.

Furca, in *Geography*, a mountain of Switzerland, on the N.E. extremity of the Vallais, the afcent of which is fteep and difficult. A number of rugged and forked rocks, piled one above another, have occafioned, it is faid, this chain to be called the "Furca." Near the fummit, the height of which is eftimated at 13,000 feet, between the Blaueberg and the Langnetz, a large body of ice fupplies a torrent, which is probably one of the firft fources of the Rhone. The glacier of the Furca is an immenfe body of ice, extending at leaft three miles in length, and near a mile in breadth between the Gletcherberg and the Satzberg, rocks more rugged, if poffible, than any of the neighbouring mountains; it ftretches from their foot, fills up the intervening chafm, and reaches almoft to their fummits. The river Rhone is chiefly formed by this glacier: the fmall torrent, already mentioned, being joined by feveral ftreams, lofes itfelf under the vaft arch of ice that forms the bottom of the glacier, iffues confiderably augmented, and is the great and principal fource from whence the Rhone takes its rife.

Furca & *flagellum*, in our *Old Writers*, denotes the meaneft of all fervile tenures, when the bondman was at the difpofal of his lord for life and limb. "Ipfe tenet in villenagio ad furcam & flagellum de domino fuo, &c."

Furca, *and Foffa*, in our *Ancient Cuftoms*, *i. e.* gallows and pit, denoted a right or jurifdiction of punifhing felons; *viz.* men with hanging, women with drowning.

FURCHE, in *Heraldry*, a crofs forked at the ends. See Cross.

FURCONIUM, in *Ancient Geography*, a town of Italy, in Samnium, belonging to the Veftini; at fome diftance S. of Amiternum: it was alfo called *Furconia*.

FURCULA, in *Anatomy*, the fame with clavicula.

Furcula, in *Geography*, a mountain of Switzerland; 13 miles W. of Chiavenna.

FURET, in *Zoology*, the *ferret* or Mustela *furo*.

FURFUR, in *Medicine*, fignifying literally *bran*, in the Greek πίτυρον, has been applied to various excrementitious matters refembling bran; more efpecially to the little fragments of the cuticle which fcale off under certain morbid ftates of the fkin, and are alfo called fcurf, dandriff, &c. The term was alfo ufed by Hippocrates to denote a fort of bran-like particles or fediment in the urine; whence urina *furfurea*, *furfureum* fedimentum, &c. From the fame root we have

FURFURATIO, πιτυρίασις, a term ufed by Galen, and many fubfequent writers, to denote certain fcaly eruptions of the fkin: it is ufed alfo to fignify the falling off of fcurfy fcales in combing, &c. See Pityriasis.

FURHER, in *Geography*, a town of Hindooftan, on the road from Agra to Oajein, in the pergunnah of Shajawulpour, which is divided from that of Schore by the river Parbutty.

FURIA, in *Zoology*, a Linnæan genus of the *Vermes*, poffeffing, according to that diftinguifhed naturalift, the following effential character: the body linear, equal, filiform, and ciliated each fide with a fingle row of reflected prickles preffed clofe to the body.

One fpecies only of this genus is defcribed, that bears the appellation of the infernal fury (*Furia infernalis*), a name very amply merited, fhould the relations of its terrific powers, as delivered to us by Linnæus, be confidered as fufficiently correct.

This moft extraordinary creature is defcribed as an inhabitant of the vaft marfhy plains of Bothnia and Finland, where it is reported to live among fhrubs or fedges, and crawling on thofe plants, is occafionally driven, or carried forward by the wind. Their progrefs, as may naturally be imagined, is fometimes intercepted by man or animals, and when they happen to fettle on any expofed part which is not perpendicularly fituated, they inftantly penetrate the fkin, and bury themfelves in the flefh fo deeply, as only to leave a black dot or point where they entered. This is foon fucceeded by the moft excruciating pains, inflammation, gangrene, fwooning, and death; all which happens in the fpace of a day or two; frequently within the courfe of a few hours, unlefs the animal be immediately extracted from the flefh, and this muft be effected with the utmoft caution, by applying a poultice of curds, or cheefe, or in more dangerous cafes, by carefully diffecting between the mufcles where it had entered.

The above is the fubftance of that information which the writings of Linnæus affords us. This celebrated obferver of nature was himfelf once attacked by this malady, and, as it appears, in imminent danger of his life, but, happily for the learned world, was refcued through the hofpitable fervices of a prieft. This occurred in one of his herborizations near the city of Lund in Sweden. The prieft, perceiving at once the caufe of his malady, undertook the arduous tafk of recovering him, and this he effected by lacerating the flefh, and extracting a vermiform fubftance about half an inch in length, which he produced to Linnæus, affuring him at the fame time that this was the true and fole caufe of his diforder. Linnæus, notwithftanding its injured appearance, conceived it to be a true vermes, and without doubt, yet feeble in body, and with his mind deeply impreffed with a recollection of the agonies he had fuffered, as well as the danger he had fo narrowly efcaped, very emphatically gave it the name of the infernal fury, as it feemed to poffefs in reality thofe fatal powers which were attributed to the imaginary being fo denominated by the ancients. At his return to Upfal, he made known this circumftance in an academical thefis, and afterwards inferted it in the "Syftema Naturæ," under the name of Furia infernalis.

That the effects of this malady, from whatever caufe it may arife, are truly diftreffing, and oftentimes attended with the utmoft danger, can admit of no difpute. All the inhabitants of Bothnia and Finland are aware of thefe effects; yet upon the whole we cannot fupprefs aftonifhment, if this diforder be really occafioned by fuch an animal, that it fhould be known only to Linnæus. Blumenbach and Muller are perfuaded no fuch creature as that defcribed does exift, and Bofc, who has very lately written on this fubject, informs us, that it is generally concluded among the Swedifh naturalifts that their illuftrious countryman was in error; they admit that in the fenny parts of Sweden fuch a diforder is known to prevail in autumn, and it is acknowledged alfo that it excites the moft excruciating torments, and often terminates in death, by occafioning gangrene in the parts affected, unlefs an immediate remedy is applied. The apoftume with which the wound or cavity is filled, they defcribe as having a vermicular form, but deny that it is a worm, or any kind of animal; and the vulgar opinion is, that it owes its origin to a poifonous matter injected into the flefh by the fting of an infect, the family of which is not at prefent afcertained. Others believe that Linnæus was in fome manner impofed upon, and conceive that the object prefented to him muft be the larva of an infect; or perhaps one of the Nereides, and which, from its dried and lacerated ftate, deceived him. The latter idea we are hardly inclined to admit, fince it is fcarcely probable in our mind that this able naturalift could have been fo far mifled, and, we might alfo add, fo grofsly impofed upon, though at the fame time it muft be admitted poffible that fuch an error might have arifen from an accidental caufe, and that without any defign of impofition on the part of his communicant.

In

In an academical tract, publiſhed by C. G. Hagen in the year 1790, under the title of "Diſſertatio de Furia infernali," its ingenious author has brought together the various obſervations that have been advanced by writers relative to the Furia infernalis, and this the curious reader will not conſult without advantage. We cannot forbear, however, in referring to this production, to caution the reader not to aſſume its concluſions with precipitation. In collecting together ſuch reports, the author acquits himſelf of a pleaſing, and indeed an uſeful labour, yet it ſhould be remembered that his views are evidently to eſtabliſh a fact acknowledged doubtful, namely, the actual exiſtence of this extraordinary creature, and that without, as it appears, being in any manner acquainted with it, except on the authority of others. The opinions of the many are againſt this concluſion, and we would ourſelves obſerve, without aſſenting to either opinion, that its non-exiſtence is more diſtinctly proved in the fruitleſs reſult of all the reſearches made ſince the time of Linnæus to diſcover a ſecond example of this worm, than its exiſtence can be demonſtrated by the ſubtility of argument. Every effort to obtain another ſpecimen has been, it appears, ineffectual, though it cannot admit of doubt that the ſubject itſelf has greatly intereſted the attention of the learned, and who, from the information they had previouſly obtained, and the frequency of this malady in the eaſtern parts of Sweden, would have been directed, we ſhould imagine, with certainty to the object in view.

When the very exiſtence of an animal is denied by a reſpectable authority, as is preciſely the fact with regard to the Furia infernalis, it deſerves our ſerious conſideration: for notwithſtanding the conſummate knowledge of Linnæus, its original deſcriber, he might, from ſome adventitious cauſe, be deceived; but it cannot be ſuppoſed an aſſertion, denying the exiſtence of ſuch an object, would be advanced without the moſt poſitive reaſons for that denial, or we ſhould at leaſt ſincerely hope not. At all events, we are perſuaded the fact is ſtill uncertain, and perhaps our judgment ought to be ſuſpended till the true cauſe of the malady it is ſuppoſed to occaſion be clearly determined to ariſe from ſome other cauſe, or that the diſcovery of another ſpecimen of the ſame worm ſhould remove all doubt reſpecting it.

FURIAN Law, in *Roman Antiquity*, a teſtamentary law, ſo called from C. Furius, the tribune, by whoſe intereſt it was enacted. This law forbad any Roman citizen to leave by legacy above the value of one thouſand aſſes to any one perſon, and at the ſame time condemned the legatee to pay four times the ſum which was given him above what the law ſtipulated. See VOCONIAN *Law*.

FURIANA, in *Geography*, a river of Sicily, which runs into the ſea on the North coaſt. N. lat. 38° 11′. E. long. 12° 45′.

FURIES, *Eumenides*, *Diræ*, in the *Heathen Theology*, and *Poetry*, were infernal deities, ſuppoſed to be the diſpenſers of the divine vengeance, the puniſhers of wicked actions both here and hereafter, and the inflictors of terrors, wars, and peſtilence.

The furies were reputed the miniſters of Pluto, and the avengers of crimes. Strabo paints them clothed in long robes falling to their heels, but girt about the breaſt. They were three in number, TISIPHONE, MEGÆRA, and ALECTO. Theſe names, which import *rage*, *ſlaughter*, *envy*, &c. were perfectly applicable to them.

The poets ſpeak of great numbers of furies, ſome of whom were employed in tormenting criminals in Tartarus, or others wandering over the earth to tempt, or to puniſh the wicked here. Thus Virgil ſpeaks of the

"— agmina ſæva ſororum." Æn. vi. ver. 571.

But the three, above named, were ſuppoſed to exceed all the reſt in cruelty and malice, and the power of doing miſchief, and are called, by way of eminence, *the Furies*, and ſometimes the *Diræ*, a name peculiar to theſe three. They were three ſiſters, and born at one birth of the goddeſs of Night. Lycophron and Æſchylus ſay, they were the daughters of Night and Acheron. Others pretend that they owe their birth to Pluto and Proſerpine. Sophocles makes them ſpring from the Earth and Darkneſs; and Epimenides ſays, they were the ſiſters of Venus and the Parcæ, and the daughters of Saturn and Euonymus.

Patin, Spanheim, &c. will have it that we ſee theſe on the medal of the emperor Philip, ſtruck at Antioch, on whoſe reverſe are repreſented three women dreſſed as above mentioned, and armed with a key, and burning torches, poniards, and ſerpents.

Struvius, Antiq. Rom. Synt. cap. i. p. 182. adds, that the three furies may probably be no other than the triple Hecate, whom the ancients believed to purſue and torment the wicked in hell, on earth, and in heaven.

Some of the poets add a fourth fury called *Lyſſa*; a Greek word, ſignifying madneſs, or rage. Plutarch allows but of one fury, whom he calls *Adraſta*, the daughter of Jupiter and Neceſſity; who, according to him, was the ſole miniſter of the vengeance of the gods. Virgil ſeems to admit the Harpies into the number of the furies, and even calls them by that name. (Æn. l. iii. 252.)

The poets repreſent the furies as old, ſqualid, and meagre, with pale cheeks, having a kind of feveriſh fluſh on them, with eyes inflamed, their heads twiſted round with ſnakes, and furniſhed with whips and burning torches in their hands, to puniſh the guilty. Their attendants were terror, rage, paleneſs, and death. Thus ſeated round Pluto's throne, whoſe prime miniſters they were, they waited his orders with an impatience that marked out all the fury which they poſſeſſed.

The daffodil was ſacred to the furies, and ſuch as offered ſacrifices to them were crowned therewith. This we learn from Euſtathius, on the firſt book of the Iliad, p. 87.

Theſe furies were alſo called *Pœnæ*, Ποιναι, on account of the puniſhments they inflicted on criminals; as their denomination furies aroſe from the rage and madneſs which they threw into the conſcience. (Voſſ. de Idolol. lib. viii. cap. 18.) The Greeks called them *Erynnides*, *q. d.* ερις νȣ, contentio mentis, or becauſe, as Pauſanius remarks, εριννυειν ſignifies to fall into fury.

The Greeks called them *Eumenides*; the origin of which name is much controverted among the learned. The etymology that ſeems beſt authorized, derives it from ευμενης, *gentle*, *mild*; which was applied to them on occaſion of Oreſtes being abſolved of the murder committed by him on the perſon of his mother. Minerva, it ſeems, appeaſed and pacified the furies, ſo that they ceaſed to purſue him; upon which the Athenians ever after denominated them *Eumenides*.

But it muſt be obſerved, that, in truth, the Athenians called them by the ſame name long before Oreſtes time, as appears from the Œdipus of Sophocles. There was a temple in Athens, near the Areopagus, conſecrated to the Eumenides, whom the Athenians called *venerable goddeſſes*: Ariſtides, and the ſcholiaſt of Thucydides, ſpeak of this temple as erected in memory of the judgment of Oreſtes.

Goddeſſes ſo awful as the furies, we may naturally imagine, commanded particular homage. Accordingly they had temples in ſeveral places of Greece. But of all the temples dedicated to theſe divinities, there was not one of them, next to that built by Oreſtes in the Areopagus, more

more noted than that which the fame Oreftes built in Arcadia. Thefe temples of the furies were a fecure fanctuary for thofe who retired thither. Paufanias fays, that, after the death of Codrus, the Dorians, who were guilty of it, would all have been punifhed with death by the judges of the Areopagus, if they had not avoided it by flying for refuge to the temple of thefe goddeffes. Although the worfhip of the furies did not make fo great a progrefs in Italy as in Greece, yet they were not neglected by the Romans. This we may conclude to be the cafe, if we admit the opinion of Cicero, that the goddefs Furina was the fame with the furies.

Befides the Narciffus, they ufed likewife in their facrifices branches of cedar, alder, hawthorn, faffron, and juniper; they facrificed to them fheep and turtle-doves, as we learn from Œlian (de Animal. l. 10. c. 44.) and they ufed in their facrifices the fame ceremonies with thofe of other infernal deities. Paufanias (in Arcad.) remarks, that in the earlier times the ftatues of thefe goddeffes had nothing different from thofe of other divinities, and that the poet Æfchylus, in one of his tragedies, was the firft who reprefented them with that hideous air, and chofe ferpents that made them fo dreadful, that the firft reprefentation of his play proved fatal to many of the fpectators. The defcription given of the furies by this poet was followed, and it paffed from the theatre to the temples. Henceforth they came to be reprefented as we have defcribed them.

FURIGELDUM, in our *Old Writers*, a mulct paid for theft.

FURINA, in *Geography*, a river of Cuba, which runs into the Spanifh Main. N. lat. 20° 3'. W. long. 76° 10'.

FURINALIA, in *Mythology*, feafts inftituted in honour of Furina, the goddefs of robbers among the Romans. They were celebrated on the fixth day before the calends of September. The goddefs Furina had a temple at Rome, and a prieft called *flamen Furinalis*. Cicero reprefents this goddefs as the fame with the furies; and Turnebus, in his Adverfaria, defends this opinion, alleging that Plutarch, in fpeaking of the wood confecrated to Furina, where the younger Gracchus was killed, calls it the wood of the Erynnies, or of the furies.

FURLING Lines are fmall lines made faft to the topfails, top-gallant-fails, and the mizen-yard-arms; ferving to furl up thofe fails, *i. e.* to wrap and bind them up clofe to the yard. The mizen has but one furling line, but all the reft have two, one at each end. Thofe that are ufed for the larger fails are generally flat, and are known by the name of gafkets.

FURLONG, an Englifh long meafure, containing the eighth part of a mile.

The Englifh furlong is equal to 40 poles or perches, (the perch being $16\frac{1}{2}$ feet) = 10 Gunter's chains = 1000 links = 110 Englifh fathoms = 220 Englifh yards = 440 cubits = 660 Englifh feet = 7920 Englifh inches = 132 paces = 176 Englifh ells = 880 fpans = 2640 palms, &c. In an old law-book, printed in Henry the VIIIth's time, we read, that fix hundred feet, of five fcore to the hundred, make a furlong.

In Scotland the furlong is equal to forty falls = 240 Scots ells = $1\frac{1}{11}$ Englifh furlong. In Ireland the furlong is = 1.2727 Englifh furlongs.

Hercules is faid to have run a ftadium, or furlong, at one breath.

Furlong is alfo ufed for the eighth part of an acre, or half a rood.

Furlong is fometimes alfo ufed for a piece of land of more or lefs acres. "Omnibus Chrifti fidel. Johannes Blunt de Eye, arm. —Dedit Thomæ Croft & Francifco Lovel. arm. unum furlongum terræ arabilis continen. per æftimationem quatuor acras, &c." Dat. 20. Jan. 3 Eliz. The furlong, as a fuperficial meafure, is generally 10 acres, according to the acre of different counties. The Englifh fquare furlong is = 10 Englifh acres = 40 roods = 1600 fquare poles = 100 fquare Gunter's chains = 10,000 fquare ftaves = 1,000,000 fquare links = 48,400 fquare yards = 435,600 fquare feet = 174,240 fquare paces. See Measure.

FURLOUGH, in *Military Language*, a licence granted by an officer to a foldier to be abfent for fome time from his duty. See Deserters.

FURMION, in *Geography*, a town of Iftria; 18 miles E.S.E. of Umago.

FURNA, a fmall ifland in the Grecian Archipelago. N. lat. 37° 42'. E. long. 26° 19'.

FURNACE, an utenfil, or veffel, proper to contain fire, or to raife or maintain a vehement fire in, whether of coal or wood.

There are divers kinds of furnaces, of various forms, and for various ufes.

The domeftic furnace, ufed in making confections, &c. is ufually of iron, or earth.

Thofe ufed by the goldfmiths, refiners, &c. are much larger, and of a different ftructure.

Thofe wherein lime, bricks, &c. are burnt, are called kilns.

Furnace, in general, means a veffel or place in which high, or long continued heat can be applied in chemiftry, in the arts, and domeftic economy, and thefe are either fixed or portable.

Furnaces are principally divided into two kinds, thofe which act by the draught of a chimney and called *air* or *wind furnaces*, and thofe in which the air is forced in by bellows and called *blaft* furnaces. But before we give defcriptions of the different furnaces ufed in various chemical and other operations, we fhall give a brief outline of their general principles, firft premifing that furnaces commonly confift of three diftinct parts; a body, or cavity to contain the fuel, a chimney to carry off the heated air and fmoke, and a receptacle under, and feparated from the body by a grate, and called the afh-pit. Although the conftruction of furnaces is a fubject of the greateft importance to thofe employed in chemical and metallurgic operations, we yet do not find that any chemift or other philofophical writer has given principles, or any thing like a theory, from which rules might be deduced for the conftruction of a furnace of any kind, that fhould with certainty fulfil its intention; and a perfon, wifhing to build a furnace, has hitherto had no other guide than that of taking the exact dimenfions of fome other furnace, that by mere guefs has been fo conftructed as to act well. One fact we may ufe as a general rule, that is, that fince the heat is generated by combuftion, it muft be the greateft when the greateft quantity of fuel is confumed in the leaft time, and when the fuel is in fufficient quantity, the heat will be in proportion to the quantity of oxygen paffing through the fire in a given time.

In fuch a furnace as we have juft pointed out, with a view to define the parts, if the fire be kindled, the air in that part will become fpecifically lighter, and will therefore afcend; the place of the afcending air muft be fupplied from below, and if there be no opening below, but through the grate, all the oxygen which enters muft contribute to the increafe of the combuftion.

Every increafe of heat will give an additional levity to the

the air, and for a certain length of time the heat will continue to increafe till it arrives at its maximum.

The velocity with which heated air afcends is as the difference of fpecific gravity between that of the atmofphere and the heated air. The principles on which the motion arifing from a change of fpecific gravity may be referred to the eafe of two weights hanging over a pulley. If they are of equal weight no motion is produced, but if one be increafed, or the other diminifhed, the heavy one will defcend and the light one afcend, with a velocity proportionate to their difference.

If the fum of the weights be W and their difference P, then, according to Mr. Atwood's theorem, which he confirmed by experiment, the velocity at any point will be $\frac{P}{W}$ multiplied by the velocity which a body would acquire by falling freely through the fame fpace.

The rifing or falling of bodies in different fluids may be referred to the fame calculation, by fubftituting their fpecific gravities for the abfolute gravity of the weights.

Let $1 =$ the denfity of the furrounding air,

$d =$ the difference of temperature between the furrounding and heated air in degrees of Fahrenheit,

$P =$ the number of degrees of Fahrenheit required to double the bulk of a given quantity of air,

$h =$ the height of the chimney,

$S =$ the fpace a body will fall through in a fecond of time,

$v =$ the velocity of the afcending air: then the increafe of bulk in the heated air will be $1 + \frac{d}{P}$, and the denfity, compared with the furrounding air, will be $\frac{P}{P + d}$. The difference of denfity will be $1 - \frac{P}{P + d} = \frac{d}{P + d}$, and the fum of their denfities $\frac{2P + d}{P + d}$; then $\frac{d}{P + d} \div \frac{2P + d}{P + d} = \frac{d}{2P + d}$. This fraction, agreeable to Mr. Atwood's theorem, multiplied into the velocity a body would acquire by falling through h, will give the velocity of the afcending air;

$S : 4S^2 :: h : 4Sh$; then $2S^{\frac{1}{2}} h^{1}$ will be the velocity a body would acquire by falling through h.

Hence $\frac{d}{2P + d} \times 2S^{\frac{1}{2}} h^{\frac{1}{2}} = v$, the velocity of the afcending current.

In finding d, let the temperature at the bottom of the chimney $=$ B; that at top T; and let the temperature of the air which enters at the grate be M: then $d = M - \frac{B + T}{2}$.

The above theorem will require an equation for the friction of the tube, which will be very great in chimneys made of brick. It is plain that if it were not for the friction of the tube, the velocity would be as the fquare root of the height, all other things being equal.

In order to afcertain how far the friction of the tube affects the ratio of the fquare root of the height, I took (fays the writer of this article) an iron tube of one foot long and two inches in diameter, having a funnel-fhaped mouth, at the lower end, four inches wide, and about the fame length. At the top of the tube was placed a fmall paper fly, with its axis vertical, fo that it might be turned by the rifing current, in a manner fimilar to the fly of a fmoke jack.

I found that a very fmall change of temperature was capable of putting the fly in motion. And that keeping both my hands upon the outfide of the funnel, at the fame time that there was free accefs of air into its mouth, I had conftantly about 45 revolutions made by the fly in a minute. Reckoning the difference of temperature, or d, 45° Fahrenheit, which was about the fact, it would give by the theorem above ftated the velocity about ⅜ths of a foot per fecond, which was near the truth.

The fly was then removed and placed at the top of the tube, lengthened to four feet. The velocity in this inftance by the theorem fhould have been 75, but did not exceed five, fo that the defect produced by the friction was .25. It would appear, therefore, that every increafe of velocity, by increafing the height of the tube given by the theorem, may be divided by two, to reduce it to experiment. For the retardation by the friction, and the acceleration of its rifing, are in the fame ratio, that is, as the fquare root of the height. If, however, the velocity be increafed by the change of temperature, or as d, then the friction will be increafed in a greater ratio; for the friction is as the fquare of the velocity. Therefore, if the velocity be twice as great from increafing d, the friction will be four times as great. Hence the height of a chimney cannot increafe the power of a furnace only to a certain extent, fince the friction, after a certain limit, would prevent the acceleration, and bring the velocity to an uniform motion.

By other experiments I found that the manner in which the air enters the mouth of the tube is of fome confequence. When the mouth of the funnel was held about two inches above the furface of a table, the current up the tube was hardly fufficient to put the fly in motion, and it would not begin to move till the mouth was elevated four or five inches. If, however, one-half the funnel refted upon the table, and the other over the edge of it, the fly went at the rate of 45 revolutions in a minute. When the funnel's mouth was covered with paper, having a hole in the middle equal to the area of the tube, 47 revolutions were produced; but when the whole mouth was expofed about the fame height above the floor, it produced 49 revolutions.

It appears, therefore, that when the air can afcend freely and perpendicularly to the entrance of the furnace, it is to the greateft advantage.

Since, agreeably to the nature of our theorem, the velocity of the current muft depend upon the difference of temperature between the internal and external air, the air entering the furnace ought to be as cool as poffible. A furnace, therefore, fhould be fo fituated, that its air may be fupplied from a cellar below, into which its afh-pit fhould terminate. This cellar fhould be as fpacious as poffible, and the afh-pit fhould be at leaft four times the width of the furnace, reckoning from the grate to the floor; but the higher the better, becaufe the air, as we have before ftated, is fupplied with fo much more facility in a perpendicular direction.

The grate of an air-furnace confifts of a number of fingle bars, having fhoulders at each end, fo that when they are laid fide by fide, bringing their fhoulders together, the interftices between the bars may be nearly equal to the breadth of the bars. The diftance between the bars is here rather more than is in common ufe, but for producing great degrees of heat, this account will be found to anfwer in practice. The bars are merely laid upon two bearers placed in the brick work at right angles to the bars; one of the bearers being loofe for the purpofe of fliding backwards to let all the bars fall down with the fire. Without this contrivance,

trivance, after any procefs is finifhed, the fire would have to burn itfelf out, and it would be much more troublefome to clean the furnace when it is choaked with flag.

The height of the fire-place muft be fuited to the purpofe to which the furnace is applied. If it is a melting furnace, the height muft be fuch that the fuel may be about half the width of the furnace above the top of the crucible, the latter being raifed about $\frac{1}{4}$th the width of the furnace above the grate.

The chimney of an air-furnace fhould be as wide as the fum of all the interftices through which the air enters the fire, allowing nothing for friction; but as this is very confiderable, at leaft that ought to be double, fo that the chimney fhould never be lefs than half that of the furnace.

The height of the chimney is the next confideration. In the prefent ftate of our knowledge we have no exact rule for the height of chimneys of furnaces. Indeed it will depend upon fo many circumftances, that it would be difficult to give this ftatement exactly; fince, however, the height is limited by the friction, it will be important to avoid all thofe circumftances on which the friction depends. The principal of thefe are, the roughnefs and narrownefs of the chimney. The velocity of the afcending air will be inverfely as the width; and the friction will be as the fquare of the velocity. It is equally certain that the friction will be much increafed if the chimney be rough in the infide, but more particularly when it is crooked, or when the air is interrupted by having to move in any other direction than that of a perpendicular one.

When, therefore, the chimney confifts of an upright prifm or cylinder, having its interior furface as fmooth as poffible, it muft act to the greateft advantage poffible.

If the chimney be made of brick, thofe fides of the bricks intended to form the interior of the chimney fhould be rubbed to make them fmooth, and laid with fine well-tempered fire clay, that the interior furface may be free from cavities and other inequalities.

If the chimney confifts of iron lined with clay, it fhould confift of lengths of about two feet each. After each of the pieces are lined and well dried, but not hard baked, the infide fhould be fcraped or rubbed, to give them greater fmoothnefs. By this means the height of the chimney may be increafed to advantage beyond the ordinary height; fince the above pieces or lengths may be fitted together and feparated with the greateft facility, and the maximum of height may be eafily afcertained by experiment.

Another very important circumftance ought to be attended to in the conftruction of chimneys. The air which is heated in paffing through the fire fhould retain its heat, if poffible, till it clears the top of the chimney. Although this cannot be effectually accomplifhed, it may be effected as far as the non-conducting power of the materials of the chimney will admit.

Common bricks are very bad conductors, and confequently not well adapted for chimneys. But fome fire-bricks of loofe aggregation are ftill better calculated to retain the heat.

The beft method, however, of making perfect chimneys, is firft to build one of very clofe, fmooth bricks, making the internal furface as above directed. This fhould be furrounded with a fecond chimney, leaving a cavity between the two about the breadth of a brick. This cavity fhould be filled with powdered coak, or, what is better, powdered charcoal. The heated air would retain its original temperature much longer in fuch a chimney, which would admit of its being carried higher, and increafe the draught.

The chimneys of portable furnaces are generally made of rolled iron. Thefe chimneys carry off the heat fo rapidly, that the height is very foon limited, and beyond that point becomes an evil. It has been recommended by Lavoifier to make the chimney of a double iron tube, and fill up the cavity with powdered charcoal. By this means, however, the internal tube would become fo hot as to be eafily acted upon by the air, and by fulphuring the fuel confequently would foon be deftroyed. If the cavity between the two tubes were to be filled with a foft compofition of equal parts of lime, clay, and fand, making the cavity between the tubes about half the width of the inner tube, an earthen tube would be formed, which would form an excellent chimney, even after the interior tube of iron was deftroyed. The furnace itfelf, being lined to a proportionate thicknefs with the above compofition, would make a portable air-furnace capable of producing the greateft degrees of heat.

In thofe air-furnaces, where the fire-place is required to be diftinct from the chimney and open at the top, fuch as *Plate* II. *fig.* 3, the chimney is required to be connected with the fire-place by an horizontal channel called a flue. This flue muft always be confidered as an impediment to the draught of a furnace, and ought never to be ufed but where the feparation of the chimney from the fire-place is abfolutely neceffary. From the experiments above-mentioned, it will appear that the air of a furnace fhould afcend as perpendicularly as poffible; hence a horizontal flue ought in all cafes to be avoided, and it will be equally evident that this evil will be ftill greater when the air has to defcend, as in the furnace *Plate* II. *fig.* 3. In all furnaces, therefore, where the fire-place is intended to be feparated from the chimney, the flue fhould be made to afcend as much as poffible by making an obtufe angle with the fide of the furnace inftead of a right one, as in *Plate* I. *fig.* 1. Various opinions have been advanced relative to the width of the flue. When we confider, however, that the flue is a part of the chimney, all opinions muft give way, for if the flue is not as wide as the chimney the air muft have to move with a proportionably greater velocity in that part, and in the fame degree leffen the draught of the furnace. Hence the flue fhould be the width of the chimney as near as poffible.

Although in ftrictnefs all furnaces are air-furnacss, yet, as we have above faid, they are ufually diftinguifhed into thofe where the air is forced through the fire by bellows, and thofe where the air enters by what is called the draught of the chimney.

Thefe are again denominated either from their conftruction, or the particular ufes to which they are applied, as will be feen in the courfe of this article. Generally fpeaking, the furnaces ufed in chemical operations, and for melting and refining metals, are of the latter kind or air-furnace; and we fhall now proceed to defcribe the parts and particular ufes.

Furnace, *Air*. An air-furnace, calculated to produce great degrees of heat, particularly adapted for a melting furnace of the fixed kind, and poffeffing all the advantages to be given to it, is reprefented in *Plate* I. *fig.* 1; *a* is the afh-pit of the furnace; *b* the grate; *c* the fire-place; *d* the cover, which confifts of an iron frame filled up with fire brick. The cover flides fideways to open the furnace; *g e* is in place of the flue of the common air-furnace, but here is made a part of the chimney *h*. The part *e f g* may be taken away without injuring the furnace, and the recefs may be employed for many purpofes, fuch as roafting fubftances, fitting crucibles upon it before they are introduced into the furnace; and occafionally a cupel may be fet upon it, for the purpofe of affaying metals, having at the fame time a fmall opening in the cover *d*, for the purpofe of admitting air. This furnace will be found much more powerful in not having a contracted flue, and at the fame time making an obtufe angle

angle with the side of the furnace. From what has been previously observed, the high ash-pit will contribute much to its action. It is also recommended that the chimney should be double, and the interstices filled with powdered coak.

Fig. 2. represents a section of a portable air-furnace, adapted to general purposes: *a b* is a frame of cast iron standing on three legs; *c* a dish of rolled iron for the ashes to fall into; *a o* the top of the frame, has a hole in the centre a little wider than the fire-place, into which the grate is fitted; *d* is a groove passing quite through the frame, a little wider than the hole in the middle, and immediately under the grate. Different pieces of sheet iron are made to fit this groove, having different sized openings for the purpose of regulating the draught. One of them, however, has no opening, and is intended to shut out the air entirely. The openings in these regulating slides being in the centre, the air will enter the furnace perpendicularly, and its passage will be much facilitated by the height of the grate from the floor, and by the air having a free access on all sides to the furnace.

i k is the fire-place; *e* the cover, consisting of either one round brick made on purpose, fitted into an iron frame, or of several pieces fitted into the same. The outside of the furnace is made of rolled iron, lined with a compound of two parts clay, two of coarse sand, and one of lime. The chimney is also of rolled iron, and consists of double tubes, *n o* and *p q*, rivetted to the outside of the furnace. The cavity between the tubes is filled with the above-mentioned composition. The other parts of the chimney, when it is required to increase its height, may be made in pieces of about two feet in length, consisting, like the parts attached to the furnace, of a double tube, and the cavity filled up as before directed. The inner tube must be a little shorter than the outer tube, so that the additional length of the outer tube may form the joint in putting the chimney together. A hole is made in the body of the furnace at *i*, and a similar one on the opposite side, for the purpose of introducing a tube through the furnace, which is required in many experiments. A slit is also made in the furnace at *k*, for the purpose of introducing the neck of a retort. The hole and slit above-mentioned have correspondent plugs made of the same substance as the lining of the furnace, by which these openings are closed when not wanted. There is another opening at *g* fitted by the plug *h*: this is used for the introduction of fuel when it is not convenient to introduce it at the mouth of the furnace. Occasionally, also, a small muffle may be introduced into it at this opening, the other end of the muffle resting upon the part *s*.

The cover being removed, a sand-bath mug may be introduced, similar to that in Dr. Black's, *Plate* II. *fig.* 7.

When a retort is introduced, and the bottom does not happen to be supported by the fuel, it is liable to move, and sometimes to be broken, by resting entirely upon the neck. This inconvenience may be remedied, by passing a solid plug through the furnace at *i*. This plug may be made by coating a piece of iron with a compound of very pure clay and sand, to render it as infusible as possible, since it will be exposed to the greatest heat of the furnace. The middle of this support must contain a recess to receive the bottom of the retort. When all the openings are closed, and a slide introduced at *a*, having an opening equal to the width of the furnace, this furnace will be found a most powerful melting furnace; and, by introducing different slides, it may be employed where the most moderate heat is required.

The air-furnace represented in *Plate* I. *fig.* 3, is principally intended for enamelling and assaying in the cupel, where the exclusion of every thing but the air of the atmosphere is particularly necessary: *a b* is an iron frame, similar to that of *fig.* 2, having a groove at *d*, for the sliding plates to regulate the draught, and a tray at *e* to receive the ashes; *g a y o* is the body of the furnace, made of rolled iron, and lined similar to that of *fig.* 2, leaving the space *m n* for the fire-place; *g p* is a dome connected at *p* by a sliding hoop, with the chimney *w*; *s* is a circular damper; *f* is a muffle, having a plug at *e*; *t* is the strong earthen tube standing upon the grate, having an opening, *t*, quite through it, which corresponds with a similar opening in the bottom of the muffle. This tube also serves as a support for the muffle; *x* is an opening through the coating of the furnace, corresponding with a similar hole in the end of the muffle. The end of the muffle is made convex, so as accurately to fit the side of the concave fire-place. Hence, a current of air will pass up the tube, *t*, into the muffle, which will escape at the opening, *x*, into the chimney *l*. This current can be regulated by the circular damper *q*. The plug, *e*, is only to be taken out to inspect the process, the damper, *q*, being at the same time shut to prevent the entrance of cold air into the muffle.

On each side of the dome are two openings, such as *h*, having plugs to fit. These are for the purpose of introducing fuel during the assaying process.

The advantages of this furnace, for the purpose of assaying, are obvious, since it can be regulated to the greatest nicety. When the current of cold air tends to cool the muffle, or the heat of the furnace is deficient, the damper, *q*, can be shut more or less; and if the heat is too great, that at *q* may be opened, and *s* shut to any degree.

This furnace may very easily be converted into a melting-furnace, or even to one for general purposes. The dome *g p*, and the muffle *f*, being removed, and a cap put upon the mouth of the chimney *w*, the furnace having a cover similar to that of *fig.* 2: the plug, *y*, being removed, will form the flue, the opening, *x*, being of no consequence, particularly when the damper, *q*, is shut; and a plug must be introduced at *e*, where the muffle was taken out. The chimney may be lengthened from the part *z* by pieces similar to those recommended in *fig.* 2.

An air-furnace, on the common plan, is represented in *Plate* II. *fig.* 2, in which *a c* is the fire-place; *c* the grate; *b* the cover; *d* the flue; and *e* the chimney. This furnace differs from the air-furnace already described only in the construction of the flue, and the ash-pit.

A fixed air-furnace, invented by Mr. Knight, is shewn in *fig.* 3: *a b* is the fire-place; *b* the grate; *c* the entrance for the air under the grate; *e* is the flue; *f* a cavity or chamber, for the purpose of baking crucibles, and other uses; *y* the passage for the air into the chimney *h*; and *i* is a sliding damper. Although this furnace possesses great conveniences, it is not calculated for producing the greatest degrees of heat, since the air must meet with much obstruction in its passage from the fire-place to the chimney. *Fig.* 4. is a furnace invented by Mr. Mushet, intended as an experimental furnace for the purpose of assaying ores, &c.: *a b c d* is a cylinder of cast iron, lined with fire-bricks, so as to constitute the fire-place *e f*; *y* is the grate having a recess in the middle for the reception of a crucible stand; *s* the ash-pit; *o* is the flue, and *g* the cover: *h i* is a rod of steel fastened into the bottom of the cast iron cylinder at *h*, and having at the other end an index *i k*, fitted to the arc *q r*, which is attached to the cylinder. When the furnace is used, the excess of expansion of the steel rod above the cast iron cylinder will give motion to the index, and if the arc be graduated, so as to correspond with Wedgwood's pyrometer, the degree of heat, in any experiment, will be known. In order to prevent the steel rod, which is polished, from oxydation, it is inclosed in a tube of iron,

iron, and the cavity filled up with powdered charcoal. The fire-place, from the grate to the cover, is three feet; the diameter at the grate ten inches, and at the top nine inches. The height of the chimney, the inventor recommends, ſhould not be leſs than thirty feet, and the width nine inches throughout.

Although this furnace has not been generally adopted, the thought is very ingenious, and, no doubt, practicable, to a certain extent. The ſcale would moſt likely require to be altered from time to time; firſt, from the change in the expanſibility of the ſteel rod; and, ſecondly, from the increaſe of the conducting power in the bricks. Theſe objections may be much obviated by attending to theſe changes. At all events, the pyrometer will enable the operator to find the relative heat, ſhould it even fail in meaſuring the abſolute degrees, which will certainly be a great acquiſition.

Dr. Black's reverberatory air-furnace is ſhewn in *Plate* II. *fig.* 1: *a b* is the fire-place; *b* the grate; *c* the cover; *a e* is an horizontal cavity through which the flame reverberates, and paſſes up the chimney *l*; *d* is a door for introducing the materials to be operated upon.

This furnace is uſed for roaſting various ſubſtances, ſuch as the ores of metals, for the purpoſe of expelling their volatile matter. It may be alſo employed for the cupellation of metals, the door *d* being a little opened for the admiſſion of atmoſpheric air.

Fig. 5. is a repreſentation of Mr. Knight's portable air-furnace; *a b* is the fire-place; *b c* the aſh-pit, which is cloſed on every ſide, excepting at the regiſter door, where the air is admitted; *o* is an opening for the reception of fuel; *e* is a receſs for the neck of a retort. *Fig.* 9. is a dome fitting the top of the furnace, to which the tube *fig.* 10. is connected, which unites with another tube inſerted into a common chimney. *Fig.* 8. is a ſand-bath, which is uſed in the abſence of the dome, and, like it, is connected with the tube 10.

This furnace is made of rolled iron, and lined with an earthy compoſition. *Fig.* 6. is a perſpective view of Dr. Black's portable air-furnace, which, but for its confined aſh-pit, has not as yet been improved upon: *a b* is the fire-place; *b c* the aſh-pit; *e* a ſliding door for the admiſſion of fuel, &c.; *d*, another door for the ſame purpoſe, and alſo for the introduction of a muffle. *Fig.* 11. is a cover, and *fig.* 7. a ſand-bath; *f* is a chimney, which is lengthened by pipes of rolled iron, or connected by the ſame with another chimney. This furnace, like the laſt, is made of rolled iron, and lined with clay and ſand.

Another air-furnace, of great power, and very convenient for operations, has been conſtructed and employed by Mr. Muſhet in his numerous and valuable experiments on iron and ſteel, a portion of which he has communicated to the public through the medium of the Philoſophical Magazine: he has obligingly furniſhed us with the drawing and deſcription. *Plate* III. *fig.* 1. is the ſection of an aſſay or melting, and annealing, and alſo a ſmall reverberatory furnace for fuſing in very high heats with the flame of pit-coal. A is the aſſay-furnace; B the reverberatory furnace; and C the annealing, or cementing-furnace.

The aſſay-furnace is caſed in caſt iron, with a flanch projecting inward, the breadth of a brick, and about half an inch more, which ſerves inſtead of bearers for the bars. (See *fig.* 2. at D.) Upon this flanch the brick-work is reared; it ought to be of good fire-bricks on the bed; the furnace is nine inches ſquare; total height 27 inches; from the top of the flanch, to the bottom of the flue, the interval is 18 inches; the flue is four inches high; the height above is five inches; flue ſeven inches long, and keeps opening into the chimney, as may be ſeen in *fig.* 3, at E. If the chimney is under 25 feet in height, a larger flue is requiſite; and if beyond 35 feet, a ſmaller flue will throw the heat more regularly through the furnace. In general, however, more harm enſues from too ſmall, than from too large a flue. G is the floor-line, and alſo repreſents the edge of a grate which covers the aſh-pit, which is better ſeen in the ground-plan, *fig.* 3, and in *fig.* 2, at H. This grate lies nine inches from the bars, leaving an open ſpace for the admiſſion of air; it projects 24 inches outwards, and ſerves the operator to ſtand upon.

H, in *figs.* 1 and 2, is the aſh-pit; in *fig.* 3, which is a ground plan of the chimney and furnaces, C is the annealing, or cementing-furnace, in which the crucibles are annealed, or baked, to a bright red heat, and from thence introduced, along with the matter to be operated upon, into the aſſay-furnace. It alſo ſerves inſtead of a cementing-furnace, being eaſily made to produce a heat of 100° of Wedgwood: it may be made of any ſize, from 9 to 14 inches ſquare, a 9-inch chimney being ſufficiently wide to the extent of an 18-inch furnace.

The chimney to each furnace is carried up five feet perpendicular; they then gradually incline to the centre opening, which they enter about twelve feet above the flues: L, L, L, are dampers: from the grates of this aſſay-furnace, to the top of the chimney, the interval is 33 feet.

This furnace has melted 400 grains of malleable iron in ten minutes; and half a pound from lumps in 40 minutes. If the materials to be operated upon are prepared with judgment, any experiment, to the extent of half a pound of matter, may be performed in half an hour, and leſs quantities in much leſs time. When approaching to its higheſt heat, a Stourbridge clay crucible (which drop in 168 of Wedgwood,) will diſappear in 15 minutes, from the time that it is put in. The firſt five bring it to 140° of Wedgwood, at which caſt iron boils. Steel boils in it at 162°, and malleable iron boils at 170° to 172° of Wedgwood. It is probable, however, that the advantages of this furnace do not reſult from the height of the chimney, (which is not great,) or from the ſize of its opening; more, it is likely, depends upon the flue; the opening of the grate bars; the ſize of the fuel; and particularly the feeding of the fire.

Furnace, *Almond*, or *Alman*. This is alſo called a ſweep, and is uſed for ſeparating metals from cinders, ſlag, broken teſts, crucibles, &c. See Sweep.

Furnace, *Aſſay*. The furnaces above deſcribed may all be uſed for aſſaying or cupelling, ſee *Plates* I, II, III.

Furnace, called *athanor* or *tower* furnace. This was a conſtruction of air-furnace, calculated to preſerve an equable degree of heat for a conſiderable length of time; it was much employed by the alchemiſts and chemiſts of the laſt and preceding century in their tedious and repeated diſtillations, calcinations, &c. but is not at preſent in uſe.

Furnace, *Balling*. See Iron.

Furnace, *Bellows* or *Blaſt*. Having given an account of the principles, and deſcribed the varieties of air, or draught furnaces, we ſhall give ſome account of thoſe furnaces which are ſupplied with their air by mechanical means, and are called blaſt-furnaces. This part, however, will not compriſe thoſe on the large ſcale for ſmelting iron, as that ſubject has been amply treated under the article Blast-*Furnace*. We ſhall, therefore, confine ourſelves to the ſmaller blaſt-furnaces employed in chemical experiments requiring great and ſudden heat.

It will appear, from what has been obſerved reſpecting the principles of furnaces, that if the aſh-pit of a common air-furnace were made perfectly cloſe in every part, excepting through the grate, and an opening into the aſh-pit into which the nozzle of a pair of double bellows may be inſerted,

ferted, a blaft-furnace would be found differing from an air-furnace only in the mode of forcing the air into the fire. Indeed its action would be fo fimilar to that of an air-furnace, that it might for moft purpofes anfwer the fame end.

The blaft-furnace for philofophical experiments was much improved by the ingenious Dr. Lewis, who fitted up a black-lead crucible for this purpofe. The pot chofen fhould be of the largeft fize, and if a cover or dome, or an additional part be wanted, another pot with a portion of its lower narrow part fawed off makes a very convenient one. A round plate or flip fawed off from the folid part of the bottom ferves very commodioufly both for a grate and for a fupport to the crucible; eight or nine holes, about three quarters of an inch in diameter, are bored round the outer part of the plate for the tranfmiffion of the air forced in by the bellows, which holes are made to widen downwards to prevent their being choaked up by pieces of the fuel. The air was forced in by bellows by an aperture on the fide of the pot.

In operations which require a confiderable degree of concentrated heat, it has been propofed to impel a number of flames into one point by ftreams of air driven from different parts of the circumference of the fuel to the middle by means of feveral bellows placed round the furnace. But a number of bellows being incommodious, Dr. Lewis has contrived to multiply the ftream of air from one bellows. The pot which ferves as a furnace for this purpofe has a number of holes bored at fmall diftances in fpiral lines all over it, from the bottom up to fuch height as the fuel is defigned to reach to.

The crucible is placed on a proper fupport in the bottom; and the holes are obliquely directed towards the crucible, fo that the impelled heat plays in a kind of fpiral upon its furface. The pot which ferves for the blaft furnace already defcribed, with an iron ring at the top, receives this perforated pot fo far, that all its holes are within the cavity, which cavity has no other outlet than the round aperture for the bellows; and therefore the air thus blown in will diftribute itfelf through the perforation of the inner pot.

Mr. Arthur Aikin has confiderably improved upon this plan of Dr. Lewis's, and the following is a defcription of his furnace, as publifhed in the Philofophical Magazine.

Plate IV. *fig.* 3. is a view of a fection of this furnace. It is formed of three black-lead crucibles. The 1ft, *a*, is a crucible cut off near to the bottom, leaving a portion of the internal cavity; the 2d, *b*, is what contains the fire and the crucible. The bottom of this crucible is perforated with holes for the admiffion of air, as fhewn at *fig.* 4, which is blown into the cavity in the bafe part *a*, by double bellows. The ftand of the crucible has a projecting part which fits a hole in the bottom of the crucible *b*, in order that it may ftand more firmly (fee *fig.* 5.); *c* is a third crucible fometimes inverted upon that of *b*, when the fire requires to be heaped up higher, or to keep off the glare of light. This has a hole in the fide to let out the air, and another into the bottom laterally, for the purpofe of introducing an iron inftrument to lift it on and off.

This furnace is particularly adapted for a lecture room, fince its fire can be raifed to its full heat in a very little time; at the fame time it is capable of producing a greater heat than almoft any other furnace.

Mr. Aikin has adapted this furnace to experiments with the cupel, by having a crucible with a hole through the bottom, and a ftand having a correfponding hole through it, communicating with the cavity in the part *c*. In the infide of the crucible are feveral projections forming a fhoulder or flange to fet the cupel upon. An earthen tube is fitted into the cover extending obliquely out of the mouth of the furnace; this ferves to look down for infpecting the procefs.

Several kinds of fmall blaft-furnaces are alfo ufed in the arts, particularly that ufed in melting pig iron for the purpofe of cafting. This furnace is called a cupola, and will be defcribed under iron. See Iron.

Furnaces *for making Colours*, are thofe for fubliming cinnabar or fulphuret of mercury for making vermilion; for fubliming fulphuret of arfenic for making king's yellow; for calcining blood for making Pruffian blue, ochre, &c. &c. For their conftruction and ufe, fee the arts, and the different articles in this work.

Furnace *ufed for enamelling Pictures*. The extreme delicacy which is neceffary in the procefs of firing or burning in the colours in enamel painting, renders the conftruction of the furnace an object of the utmoft importance to the artift, whofe labours are liable to be irrecoverably loft by the flighteft mifmanagement of the procefs, or error in the formation of the furnace.

We are enabled, through the kindnefs of Mr. Bone, of Berner ftreet, London, enamel painter to the king and prince of Wales, to prefent our readers and artifts of this clafs with a drawing of the furnace which he has employed for firing his moft celebrated productions, and which, we may fafely fay, have not been equalled either for the richnefs of colour and accuracy of defign, or for the fize to which he has extended the paintings on enamel, which were formerly confined to the moft minute fubjects. The lower part of *Plate* V. contains thefe drawings, which are two vertical fections taken on planes perpendicular to each other; the fame letters of reference applying to both. A reprefents the fire grate extended over the afh-pit, B, of the furnace; the fire door at C for the admiffion of the fuel is placed at the back of the furnace or fide oppofite to that where the operator is ftationed, and in a feparate room: this is intended that the fmoke, which will at fometimes iffue from the mouth of the furnace, may not endanger the pictures. The room, therefore, where the operation is performed, has no connection with the fire, fo that the whole may be conducted without duft or fmoke. The pictures are placed in a muffle E, which is open only at one end; it is fupported upon three fmall arches, F, F, F, of brick-work extending acrofs the furnace; the fpaces between thefe form three flues, which convey the flame of the fuel beneath the muffle. The mouths of thefe flues are fhewn by the three dark fquares *fig.* 11; they then turn up over the arched roof K, of the fire-place, and under the muffle between the arches F, F, F, at the commencement of thefe flues fhewn by dark fquares in *fig.* 11, and marked *a* in *fig.* 10. The flame divides, and a part proceeds over the muffle at *b*, being reverberated upon it by the arched roof of the chamber in which the muffle is fituated. After paffing over and under the muffle, the two currents of flame efcape together to the chimney N, through three flues *d*, which are beneath an iron chamber H, called the annealing oven. In this four fhelves are fixed to contain the articles which are to be annealed, previous to being introduced into the muffle. This is done through the open end which is expofed at *e* to the open air, the junction of the muffle with the wall of the furnace being made by fire clay inferted between them. Before the mouth of the muffle an iron plate, *f*, is placed fupported by brackets: this, together with the wall of the furnace, forms a table to fupport the picture when it is withdrawn from the muffle for examination. The muffle is made of fire clay in one piece, but it is very difficult to obtain materials which will withftand the heat when in fo large a mafs without cracking, which the beft that can be procured will

will do; frequently it, however, is not a very material defect, if a ſmall crack takes place at the upper part, as it begets a confidence that the muffle will not crack any further, owing probably to the unequal contraction of the parts of the muffle having liberty of action.

The operation of burning in the colours of a painting, or, as it is technically termed, *firing*, is conducted in the following manner: the picture painted, and prepared as deſcribed in our article PAINTING *in Enamel*, is placed upon a planch or flat piece of fire-ſtone, with a ſmall quantity of whiting between them, the uſe of which will be explained hereafter. Theſe are put into the loweſt ſhelf of the annealing oven H, and the door of the oven cloſed to prevent the entrance of duſt. The fire is now lighted on the grate, and after burning from three to four hours, according to the ſtate of the weather and direction of the wind, the muffle acquires a vivid white heat, and of ſimilar appearance in all parts: when this happens it is judged proper to begin firing; the pictures in the oven in the mean time have gradually acquired ſuch a heat as to be in no danger of cracking from the change of heat on entering the muffle; the planches have uſually reached a low red heat by the time the muffle is properly hot; and it is ſuppoſed that the oil uſed in mixing up the colours is nearly all evaporated, the painting exhibiting a very dull and faint appearance. It is proper that the door of the annealing oven ſhould not be too cloſe, that the vapour from the oil may readily eſcape.

The planch and picture upon it are now removed from the annealing oven by an iron fork, *fig.* 7, uſed in a manner ſimilar to a baker's peel, and introduced into the muffle: the doors are ſhut cloſe; the operator now looks through a ſmall hole in one of the doors, furniſhed with a ſliding cover, and attentively watches the picture; he ſees it gradually heat till it acquires the ſame colour as the muffle; the ſurface of the picture is then obſerved to aſſume a gloſſy appearance, ariſing from the fuſion of the enamel; at firſt this commences at the farther part of the muffle, but extends itſelf, with aſtoniſhing celerity, over the whole ſurface, if the operation is well conducted. The picture is now withdrawn from the muffle upon the table before its mouth, and examined before a ſtrong light, if every part is equally gloſſy; if not, it is returned to the muffle; in this ſtate the picture and planch only exhibit a maſs at a white heat; no traces of painting or colour can be diſcovered, and the whole judgment muſt be formed from its appearing equally fuſed in every part of the ſurface.

The fuſing being now completed, the picture is returned to the annealing oven; and the fire being put out by taking away the bars of the fire, the whole furnace cools gradually together, the picture remaining in the oven ſome hours before it is removed to paint again upon it. The operation of firing a picture requires to be performed from twelve to twenty-five times, according to the tints required, and the nature of the picture: the pictures are liable to crack whilſt in the muffle, an accident that cannot often be repaired, in which caſe the labour of painting is all loſt. The principal precaution againſt this is to proportion the flues in ſuch a manner that the annealing oven ſhall always be of ſuch a temperature that the pictures taken from it, and introduced into the muffle, may not experience ſuch a change of temperature as to fly. In Mr. Bone's furnace this is ſo well regulated, that he ſeldom finds his paintings crack in the firing, though it coſt him many ſevere diſappointments before he obtained this perfection by repeated trials: this diſpoſition to crack appears to depend almoſt as much upon the plate and enamel as the conſtruction of the furnace, and it is no proof becauſe a painting ſtands the firſt firings well, that it will not fly in the ſucceeding. Enamel pictures are nearly all liable to cockle or warp in the firing, in a greater or leſs degree, though this may be obviated ſo far, by great care in the preparation of the metal plate, as to be no ſerious detriment to the effect of the pictures: the method of preparing theſe plates is explained in the article ENAMELLING. For an account of the colours, and art of painting, ſee PAINTING *in Enamel*, which is a ſubject requiring long experience, to be added to the uſual knowledge of a painter, as the colours are in fact produced by the firing, being very different in appearance when laid on, and without any of the brilliancy for which this ſpecies of painting is diſtinguiſhed. The artiſt muſt judge concerning the effect which his painting will produce by his recollection of the change of each colour, and its combination with others, inſtead of being able to examine it conſtantly by its appearance: but it is eſſential to the perfection of enamel painting, that all the colours employed ſhould blend together in the firing, and at the ſame heat, or ſome would be too much burnt before others were properly fuſed; and they muſt be of ſuch a nature as not to emit any vapour when in the fire, as this would produce bubbles in the ſurface, and deſtroy the effect of the painting.

As the colours at preſent known which will ſtand theſe teſts are but few, and require compounding together to produce the various tints, it is an additional reaſon why none can be admitted but ſuch as are acted upon in a ſimilar manner by the fire. It is conjectured that the crack in the muffle, being found rather to improve than leſſen the effect, may ariſe from a minute draught which will take place through the muffle, carrying off any vapours proceeding from the oil, which may remain in the colours after annealing, or other cauſes, which vapour, if confined to the picture, might be detrimental to the colours. As the generality of enamel plates are made with the ſurface convex, it becomes neceſſary, when they are large, to ſupport the centre of the plate from ſinking, which they are very liable to do when in a ſtate of fuſion. To prevent this accident, the planch muſt have a bed of powdered whiting laid upon it, with its ſurface made to fit the concavity of the enamel plate as nearly as poſſible, carefully avoiding all preſſure upon the plate, leaſt it ſhould receive any ſtrain. If this operation is nicely conducted, the plates may be made to keep their ſhape much better than by any other means that have as yet been deviſed.

FURNACE *for enamelling watch Dial-plates*. This furnace, though very ſimple in its conſtruction, differs from all the others we have deſcribed in not having any bars or grating for the admiſſion of air to the bottom of the fire; the only paſſage for air being through or under the muffle, which in this kind of enamelling conſiſts only of a ſimple arch of clay without either bottom or back.

This furnace is ſingularly adapted to the purpoſe for which it is uſed, as a very intenſe heat is obtained with a comparatively ſmall quantity of fuel, in addition to which the work may be brought almoſt in contact with the coals without receiving any injury from their dirt; clearneſs in this kind of enamelling being very juſtly conſidered one of its greateſt perfections. *Fig.* 1. of *Plate* V. *of Furnaces*, repreſents a front elevation; A, A, are two piers of brick work, upon which reſt the arch B, covering the aſh, or coak-pit, C. From each ſide of theſe piers project the three bricks D, D, D, which ſupport the hearth, or iron plate, E; another plate of caſt iron lies juſt beneath this, which ſerves for the bottom of the furnace, and which may be ſeen in the ſection at F, *fig.* 2. Upon this plate of iron ſtand the Welſh lumps, G, G, forming the interior ſides of the furnace; the one which forms the back may be ſeen at G, *fig.* 2;

fig. 2: the brick-work is then carried upon each fide over the piers, and bound together by the iron bar H, which likewife ferves to fupport the brick-work over the front, in which is fixed the regifter, or damper, I. When the furnace is completed thus far, the flue may be carried up to a convenient height, or turned into one already formed.

To give the reader a clear idea of the method of ufing this furnace, as well as the way in which the fuel fhould be placed, we have given, *fig.* 2, a vertical fection through the line C I, perpendicular to the front; and that the parts in each may be compared, we have ufed the fame letters of reference as far as the parts could be feen in each figure.

When the fire is to be made up for ufe, the muffle is to be placed in the furnace; one end refting on the iron fupport, as fhewn at K, *fig.* 1, and the other end is to be kept level with the front by putting a piece of coak under each fide. The fpace on each fide is then to be filled with fmall pieces of coak, and at the back of the muffle fmall coak muft likewife be put in till it reaches about half way up the end. A folid piece of coak muft then be felected, which muft be large enough to cover the end of the muffle, and upon this a fecond piece muft be placed to fupply the place of the firft when that is burned away. The fpace then immediately above the muffle muft be filled with middling fized pieces of coak, carefully building it up in the front, fo as to keep it even with the fides G, G. The door, as fhewn at *fig.* 3, is then to be placed in the front, preffing it clofe up to the fides G, G. To light the fire, nothing more is neceffary than to fill the fpace under the muffle with red-hot charcoal, and by drawing the damper a good way out the fuel will foon be alight all over. In *fig.* 2. it will be found that we have endeavoured to fhew the pofition of the fuel placed in the order of our defcription, with a fection of the muffle fhewing the height of the charcoal which lies at the bottom when the fire is in a ftate fit for ufe. For we muft here obferve that it will be always neceffary to beat that pretty fmoothly down, that the apparatus which the dial lies on may be placed fteadily upon it.

As it would be difficult in this figure to fhew the pofition of the dial-plate in the fire, we have given, at *fig.* 8, a fection of the apparatus as it is placed under the muffle; *a* being the dial-plate; *b b*, the ring; *c*, the planch; *d*, the turner. In ufing thefe, the turner is firft placed fteadily upon the bed of charcoal, and the dial, being placed upon the ring is laid as nearly as poffible in the centre of the planch, which is conveyed under the muffle, and placed upon the turner with the fpring tongs, as fhewn at *fig.* 6. When one fide of the plate is nearly melted, the planch may be turned round by a flight touch with the tongs, till the whole dial is completely fufed all over, when it muft be withdrawn from the furnace, and placed juft in the front of the muffle to cool gradually.

Fig. 4. is an end elevation of the muffle placed on the prop, as fhewn at *fig.* 1.

Fig. 5. is a vertical fection of the fame through the line *a b*.

Fig. 9. is the iron key with an aperture in the end, which fits the fquare pin, *a*, in the door, as fhewn at *fig.* 3, and is ufed to remove the door from the front of the furnace when it is hot.

Furnace, *Founders*, is of different forms, according to the kinds of works to be caft. See Foundery and Iron.

Furnace, *Glafs-Houfe*. See Glass.

Furnace *for Glafs-Painters*. See Painting *on Glafs*.

Furnace, *Hatters*. See Hat.

Furnace, *Lamp*. See Lamp.

Furnace, *Letter Founders*. See Letter-Foundery.

Furnace, *Melting*. See *Air*-Furnace.

Furnace, *Plumbers*, is of three kinds: in the firft they melt the lead, whereof fheets are to be caft. This is only a fort of large copper, or receptacle like a copper, made of fireftone, and coated well round with clay, having a little iron pan at the bottom. In the fecond, they melt the lead to be caft in moulds for pipes, &c. which are not to be foldered. The third is the tinning furnace, which is a fquare frame of wood, or fometimes a mafs of ftone-work, with brick hearth, whereon is made a charcoal fire, which ferves them for the applying of thin tin leaves on the works. See Plumbery.

Furnaces *for baking Porcelain and Pottery*. See Kiln and Porcelain.

Furnaces, *Portable*. See above, Knight's, Black's, Lewis's, Mufhet's, Aikin's, &c.

Furnace *ufed for baking Tobacco-pipes*. We may, perhaps, be criticifed for introducing into our plates the implements of fo trifling a manufacture, but we fhall excufe ourfelves, on account of the ingenious ftructure of the furnace, and the application which may be made of it to other and more important purpofes. This furnace is to be admired for equality of the heat in every part of the crucible, or pot, in which the pipes, or other articles to be heated, are placed, at the fame time that the flame is not permitted to enter, fo as to foil the articles it contains. This crucible is marked A A, *Plate* III. *figs.* 4 and 5: it is of a cylindrical figure, terminated at the top by a hemifphere; it is placed over the fireplace, B, and enclofed within a furnace, D D, of brick-work, lined with fire-brick E E: between this lining and the crucible is a fpace of about four inches, all round in which the flame from the fire-place circulates, without interruption, except what arifes from the numerous fupports which are neceffary to fuftain the crucible in its proper pofition; but as thefe are always placed edge-ways to the flame, and are very thin, they caufe but little obftruction to its action: the fupports are 12 ribs, between the crucible and the lining, which form the fame number of flues, as fhewn by the dotted lines *x*, *fig.* 5, (the dotted circle A being the crucible): the ribs are perforated with occafional apertures, (fee the fection, *fig.* 4.) to connect one flue with the adjoining; but the principal bearing of the crucible is taken from five piers, *b b c*, formed of bricks, projecting one over the other: one of thefe piers, *c*, is placed at the back of the fire-place, and the other four at the fides *b*, *b*, and projecting at the top, nearly into the centre of the crucible, fo as to fupport and ftrengthen the bottom of it, which refts upon thefe piers, the fpaces between which form the mouths, or commencement of the flues furrounding the crucible: at the top of the crucible all the flues unite in the dome, L, of the fire-brick lining, and this has a circular opening through it, leading into the chimney N.

The lining, F E E, of the chimney is open on one fide, (fee the plan,) to form the door, at which the pipes are taken in and out of the furnace; the opening is permanently clofed as high as *k*, *fig.* 4, by an iron plate plaftered with fire-clay; above this it is left open, and only clofed when the furnace is burning by temporary brick-work: when this is removed, the furnace can be filled or emptied through the opening; and, for this purpofe, the crucible has a fimilar opening in its fide: when the furnace is burning, this aperture is clofed, by an ingenious contrivance: the workman firft fpreads a layer of clay round the edge of the opening; he then fticks the ftems of broken pipes acrofs, from one fide to the other, and plafters the interftices with clay in a manner exactly fimilar to the lath and plafter ufed in building. The whole of the crucible is made in this manner; the bottom is compofed of a great number of fragments of pipes, radiating to the

the centre; these are coated with a layer of clay at the circumference; a number of the bowls of broken pipes are inserted into the clay: in these, other fragments are placed upright, to form the sides of the crucible. The ribs round the outside, which form the flues, are constructed in the same manner, as is also the dome, L, of the fire-brick lining; by this means the crucible can be made very strong, but at the same time so thin, as to require but little clay to construct it, and is less liable to split by the heat, than a vessel formed of thicker materials. This method might, we think, be advantageously applied in other cases, where a very thin vessel or lining is required for a furnace. The pipes which are to be baked are arranged within the crucible, as shewn in the section, the bowls resting against the circumference, and the other ends supported upon circular pieces of clay, *r*, which are set up in the centre for that purpose; six small ribs are made to project inwards, all round the crucible, at the proper heights, to support the different ranges of pipes, without having so many resting upon each other, as to endanger their being crushed by the weight. By this mode of arrangement, the furnace is made to contain 50 gross, or 7200 pipes: these require to be burned from seven to nine hours; and the heat is at first brought on gently, and afterwards increased to the full heat required for baking this species of pottery: the fire is regulated by a simple kind of damper applied over the aperture in the dome, L, of the fire-brick lining. This is a mixture of horse-dung, sand, and pipe-clay, well worked together, and spread in thin layers upon coarse brown paper: a sheet of this being laid over the hole in the dome, so as to cover more or less of it, will give the means of increasing or diminishing the draught, and, consequently, the heat of the furnace.

We shall conclude this article with some useful hints relative to the different kinds of fuel, the management of furnaces, and the quality and form of crucibles.

The fuel employed is of three kinds; namely, pit-coal, coak, and charcoal; the first of which is seldom employed but for reverberatory furnaces, where substances are to be heated by flame, or heated air. The nature of coaks varies according to the manner of preparing them, and the nature of the coal. For some purposes, such as melting steel, or in other situations, where long continued and intense heat is required, the coaks are made so hard as to exhibit a bright, white, crystalline fracture. In other cases, where great heat is not required, and where expedition is more an object, the soft coaks are preferable. When a clear fire, free from smoke, and the suffocating vapour of sulphurous acid, from pit-coal coak, is required, charcoal is found exceedingly convenient. Charcoal is also sometimes mixed with coak, for the purpose of making the coak kindle more speedily.

When coak, or pit-coal, is employed, the grate is liable to be choaked, from the fusion of the earthy matter with which it mostly abounds. An iron rod, with a hook at one end, is used for removing this substance from the grate, which otherwise would prevent the passage of the air. After an air-furnace has been used for several hours, when the fire is let out, the bars ought to be taken out for the purpose of removing all the slaggy matter.

Nothing, perhaps, is of more importance, in the dry operations of chemistry, than good crucibles. Formerly we had no good crucibles but what came from Holland, and those termed Hessian crucibles. The most essential point in making good crucibles, is to get clay as free as possible from metallic oxyds, particularly iron. A crucible should be capable of bearing a heat that will thoroughly fuse the substance put into it, without becoming itself so soft, as not to bear lifting out of the fire. And it should also be capable of bearing sudden extremes of heat and cold, without cracking. The first of these objects is attained, by introducing as much pure clay into its composition as possible. Crucibles, made solely of clay, however, are very liable to crack with extremes of heat and cold. This latter evil has been avoided, by mixing the coarse powder of burnt clay with the pure clay; and sometimes for the burned clay pure white sand has been used. The crucibles used for melting steel, which requires greater heat than is generally used, are made with Stourbridge clay, and the powder of other hard coaks, which are used as fuel. These pots will sometimes bear four heats, or meltings, without cracking or losing their form.

The inside of a crucible is in figure nearly a paraboloid, and the outside a truncated cone; so that the sides are gradually thicker towards the bottom. The stands and covers of crucibles ought to be made of the same materials as the crucibles: the stand should be cylindrical, and of the diameter of the bottom of the crucible.

Previously to a crucible being put into the fire, it should be gradually heated to at least a low red heat; and a good crucible, which has been heated till it begins to vitrify, can seldom be trusted a second time in the fire.

A crucible should never be introduced, or taken out of the fire by tongs, holding it by one side only, but by such as will embrace it closely on the outside, by having the mouth of the tongs of the curvature of the crucible. When a crucible is very hot in the furnace, the fire should not be suffered to get very low, since the introduction of a great quantity of cold fuel will be liable to break the crucible. Crucibles are much more liable to crack when they have been baked very hard. If they are merely hard enough to bear putting into the fire, and to bear the weight of the materials, it is sufficient.

FURNACE, *Reverberatory*. See above, Dr. Black's, Mr. Mushet's, and the article IRON.

FURNACE, *Simple*. See *Air*-FURNACE, *Plate* I. *fig.* 1.

FURNACE, *Smelting*. See above, BLAST-*Furnace*, IRON, ORES, SMELTING.

FURNACE, *Wind*. See *Air*-FURNACE.

FURNACE *for making Steel*. See STEEL.

FURNACE *for procuring Zinc from its Ore*. See ZINC.

FURNACE *of a mine*, in the *Art of War*. See CHAMBER, and MINE.

FURNACE. See TORNAGE.

FURNEAUX, PHILIP, in *Biography*, was born at Totness, in Devonshire, in the year 1726. He received his classical education at the free-school of his native town, and was a contemporary with the celebrated Dr. Kennicott. An intimacy between these learned men was contracted in youth; it increased in advancing life, and continued till death separated the bonds of friendship. The object of their pursuits was similar, though they took different methods to attain it. Dr. Kennicott was a member of the established church, but Mr. Furneaux sought for learning, and aimed to be useful among the Dissenters. He studied under the patronage of Mr. Coward's funds, and having diligently pursued that course of learning which is preparatory to the exercise of the ministry, he settled with a congregation at St. Thomas' Southwark, and soon afterwards was chosen one of the Sunday evening lecturers at Salters' hall, in London. He became a very distinguished preacher, on account of the solemnity and fervour of his manner, and the energy of his pulpit discourses. In 1753 he removed to Clapham, and succeeded Mr. Moses Lowman, the well-known writer on the book of Revelation,

as paftor of the diffenting congregation in that village. Here he continued his minifterial duties for more than 23 years, and under his labours that fociety became one of the moft opulent and refpectable in the neighbourhood of the metropolis. During this period he received the diploma of doctor of divinity, and was elected one of the truftees to the fund, to which he was in a great meafure indebted for his education. In the year 1777 he was attacked by a malady, which terminated in mental derangement, from which he never completely recovered till his death, which happened in the year 1783, when he had attained to his fifty-eighth year. As a writer of great force and energy, Dr. Furneaux is known by a few fingle fermons, but to general readers, more particularly by his "Letters to the honourable Mr. Juftice Blackftone, concerning his Expofition of the Act of Toleration, and fome pofitions relative to religious liberty, in his celebrated Commentaries on the Laws of England." The judge never condefcended to notice this able attack upon his work, but he did more; he felt he had taken his ftand on ground that was not tenable, and in his fubfequent editions omitted fome obnoxious paffages and altered others, which had brought upon him the animadverfions of Dr. Furneaux. To the fecond edition of this work, publifhed in 1771, an appendix was fubjoined, containing "Authentic copies of the argument of the late honourable Mr. Juftice Fofter, in the court of the Judges Delegates, and of the fpeech of the Right honourable lord Mansfield, in the Houfe of Lords, in the caufe between the city of London and the Diffenters, in the year 1767;" this latter he wrote entirely from memory, but with fuch correctnefs, that it received the full approbation of the learned lord, with whofe notes, taken on the occafion, it fully correfponded. So highly did his lordfhip regard the doctor, that when under the moft grievous calamity, to which we have referred, he contributed liberally to his fupport. Dr. Furneaux was author likewife of "An Effay on Toleration," in which he had a particular view to an application which had then been lately made by the diffenting minifters to parliament. Gen. Biog.

FURNEAUX *Ifland*, in *Geography*, an ifland in the Pacific ocean, lying in S. lat. 17° 5'. W. long. 143° 16, difcovered by Bougainville, and afterwards by captain Cook, fo named in honour of captain Furneaux, who commanded the Adventurer in his fecond voyage. This ifland, together with Refolution ifland, S. lat. 17° 24'. W. long. 141° 39'; Doubtful ifland, S. lat. 17° 20'. W. long. 141° 38'; and Adventure ifland, S. lat. 17° 4'. W. long. 144° 30', and feveral others, conftitute a clufter of low, and half-drowned ifles, denominated by the French navigator the "Dangerous Archipelago." Furneaux ifland is rather a coral-fhoal than an ifland, of about 20 leagues in circuit. The fmall part of it, which is land, confifts of little iflets ranged along the north fide, and connected by fand-banks and breakers. Thefe iflets are clothed with wood, among which the cocoa-nut trees are diftinguifhable. Captain Cook ranged the fouth fide of this fhoal at the diftance of one or two miles from the coral-bank, againft which the fea broke in a tremendous furf. In the middle is a large lake or inland fea, in which was a canoe under fail.

FURNES, or VUERNE, a town of France, and chief place of a diftrict in the department of the Lys, feated on the canal that leads from Bruges to Dunkirk, about three miles from the fea. The town-houfe is a good building, adorned with figures of kings and princes; it has a handfome tower, with mufical chimes; 15 miles S.W. of Oftend. The place contains 3,220, and the canton 13,088 inhabitants, on a territory of 192½ kiliometres, in 19 communes. The whole extent of the diftrict comprehends 715 cantons, 91 communes, and 49,808 inhabitants. N. lat. 51° 4'. E. long. 2° 27'.

FURNITURE, in *Dialling*, certain additional points and lines drawn on a dial, by way of ornament.

Such are the figns of the zodiac, length of days, parallels of declination, azimuths, meridians of the principal cities, Babylonic and Italian hours, points of the compafs, &c. See DIAL.

For drawing furniture on dials, the *analemma*, or trigon of figns, is an inftrument of principal ufe.

FURO, in *Zoology*, a name given by fome authors to the *Ferret*, a fpecies of the MUSTELA, which fee.

FUROR UTERINUS, in *Medicine*, a term employed by Sennertus, and others, to denote a fpecies of madnefs in females, which is principally characterized by an ungovernable defire for the fexual intercourfe. It is called by the nofologifts *Nymphomania*, which fee.

FURR, in *Commerce*. See FUR.

FURRETIERRE, ANTHONY, in *Biography*, was born at Paris in 1620. He was intended for the profeffion of the law, and obtained an office in that department, but at length entered the ecclefiaftical ftate, and rofe to preferment in the church. He was diftinguifhed by fome compofitions in verfe and profe, and became a member of the French academy, the meetings of which he attended with great affiduity; but being embroiled in difputes refpecting a dictionary which he propofed to publifh, and which was fuppofed to have originated from one then compiling under the aufpices of the academy, he was expelled, and continued, till his death, in a ftate of expulfion. The academy was not content with carrying on their refentment while the object of it was alive, but decreed that the ufual funeral fervice performed on the deceafe of a member fhould not be performed for Furretierre. This was in the year 1688: His "Dictionnaire Univerfel" did not appear till two years after his death. An improved edition was publifhed in 1701, in three volumes folio, and again in four volumes at Amfterdam in 1725. This work has ferved as the bafis of the "Dictionnaire de Trevoux," publifhed in 1771, in eight volumes. Furretierre was author of other works, as "Five Satires, in Verfe;" "The Gofpel Parables, in Verfe;" and "Le Roman Bourgeois." Moreri.

FURRS, *Timber of*. See TIMBER.

FURR, in *Heraldry*, a reprefentation of the fkins of certain wild beafts, feen both in the doublings of the mantles of coat-armour, and in the armour itfelf.

The heralds ufe two metals, five colours, and two furrs, or hairy fkins; *viz.* ermine and vair.

The origin of thefe furrs Mackenzy afcribes to the fhield's being anciently covered with fkins; which fkins, or coverings, were afterwards reprefented in the fhields; a more probable derivation, in our opinion, than to fay they were placed on fhields, becaufe they had been worn in mantles and garments.

Furrs either confift of one colour, which is white; but cannot be ufed in arms fingly, or more than one; and thefe either two, or more than two.

Furrs of two colours are either ermine, being white with black fpots; ermines, black with white fpots; ermines, whofe ground is yellow, and the powdering black; or pean, which is black powdered with yellow. When the ground is white, powdered with black fpots, each fpot having one red hair in the middle, it is called erminites.

Furrs of more than two colours are called *vair*, and *vairy*; which fee.

FURRIER,

FURRIER, a perfon who trades, or works, in furrs, or lines robes, &c. therewith.

Furrier's *Clippings*, in *Agriculture*, the refufe clippings produced in large manufactories by furriers; and which are capable of being employed as manure with great advantage. They are much employed in Hertfordfhire and fome other counties contiguous to the metropolis; where they are ufually purchafed at from about twelve to thirteen fhillings the quarter, which confifts of a ten-bufhel fack crammed quite full, and moftly weighing about two hundred and a half. They are conveyed to the lands at the expence of about three-pence the quarter. And they are applied by fowing them over the ground, by the hand, from a feed-fcuttle, at the further charge of about three-pence the quarter, where wheat or barley is defigned to be fown, being immediately afterwards turned in by the plough, and then the feed is fown and harrowed in. After this has been done all fuch pieces of the clippings as are left above the furface are picked, dibbled, or fhoved into the mould by the point of a ftick made for the purpofe, in order to prevent their being carried away or devoured by dogs, crows, &c. which are very fond of eating them. The quantity generally made ufe of to the ftatute acre is about three-quarters. They are found to anfwer extremely well on light, dry, chalky, or gravelly foils, where they are fuppofed to hold the moifture in a manner fo as to prove of great affiftance to the crops in fuch feafons as are hot and dry. In the wetter forts of land they are not believed to afford much benefit. See Manure.

FURRING *of a Ship*, is laying on double planks on her fides. This is done after the fhip is built, and is by the failors called *plank upon plank*. But there is another way of furring, which is more properly fo called; and that is, when a fhip's planks are ripped, and new timbers are put on the former timbers, and on them other planks; which is done fometimes to make the fhip bear the fails the better.

Furrings, or *Furrs*, in *Architecture*, are ufed for the making good of the rafter-feet in the cornice.

When rafters are cut with a knee, thefe furrings are pieces which go ftraight along with the rafter, from the top of the knee to the cornice.

When rafters are rotten or funk hollow in the middle, there are pieces cut thickeft in the middle, and tapering towards each end, which are nailed upon them to make them ftraight. Such pieces are called furrs; and the putting them on is called furring the rafters.

FURRIPOUR, in *Geography*, a town of Hindooftan, in Rohilcund; 12 miles S. of Bareilly.

FURROW, among *Gardeners*, denotes a ridge or fwelling on the fide of a tree, ftalk, or fruit.

Furrow, in *Agriculture*, the trench or opening made by the plough in breaking up, turning, or ftirring land. The furrows fhould in general be lefs perfectly turned when for the feed, than in cafes of breaking or ftirring the ground.

Furrow-*plough*, fuch as is employed in forming water furrows. See Furrowing *Plough*.

Furrow, *Two*, or *Double Plough*, a name applied to fuch ploughs as are conftructed in a double manner, or fo as to produce two furrows at the fame time. See Plough.

Furrow-*roller*, a particular tool of the roller kind, contrived fo as to operate in the furrows of the ridges.

Furrow-*flice*, the narrow flice or flip of earth raifed and turned over by the plough, in breaking up or ftirring land.

The Scotch writers on hufbandry frequently denominate it *fur-flice*.

Furrow, *Water*, a deep open fort of trench or furrow, made by a plough, contrived for the purpofe or otherwife, in lands under tillage, in order to draw off and drain them of the water that may ftagnate or prove injurious to the growth of the crops. Thefe furrows fhould conftantly be drawn in fuch directions as are the moft proper for readily difcharging the water, even flanting acrofs the ridges where the nature of the fituation requires it; and be kept perfectly open and free by means of the fpade during the winter months, efpecially where the land is inclined to be wet, and the crops are of the wheat kind. The forming of thefe furrow-drains fhould be executed immediately after the fowing of the land has been finifhed. They are particularly neceffary on all the more ftiff and retentive forts of land, as without them the crops feldom fucceed well in fuch cafes.

FURROWING Plough, a fort of plough conftructed for the purpofe of forming water-furrows in lands of the more heavy moift kinds.

This fort of work is much more readily, as well as much more effectually performed, by this fort of plough than thofe of the common kind. See Plough.

FURRUCKABAD, in *Geography*, a town of Hindooftan, in the circar of Rohilcund, on the weft fide of the Ganges, and capital of a diftrict belonging to a prince of the Patan Rohilla tribe; about 30 miles in length along the bank of the Ganges; 76 miles N.W. of Lucknow. This fmall independent territory has been added to the Britifh dominions. N. lat. 27° 23'. E. long. 79° 52'.—Alfo, a town of Hindooftan, in the country of Bengal, near the Ganges; 42 miles N.N.W. of Moorfhedabad.

FURRY's Town, a town of the ifland of Jamaica, in the county of St. James; 20 miles N.E. of Savannah-la-Mer.

FURSEY, a fmall ifland of England, at the entrance into Pool harbour.

FURSHOUT. See Farschout.

FURSTEMBERG, Ferdinand de, in *Biography*, an eminent prelate, was a defcendant from the free barons of that name in Weftphalia, and was born at Bilftein in 1626. He ftudied at Cologne, where he contracted an intimate friendfhip with Chigi, who was then nuncio, and afterwards a cardinal and pope. During the cardinalatefhip of Chigi, he invited Furftemberg to refide with him, whom he raifed to the bifhopric of Paderborn in 1661, when he himfelf was feated in the papal chair, under the title of Alexander VII. The high reputation of the bifhop attracted the notice of Van Galen, who appointed him his coadjutor, and whom he fucceeded in 1678, when he was declared by the pope apoftolical vicar of all the north of Europe. He was a zealous catholic, and anxious for the converfion of thofe who were not already within the pale of the church; but at the fame time he did not neglect the cultivation of the belles lettres, either by his own efforts or thofe of many learned men whom he patronized. He died in 1683. As an author he collected a number of MSS. and monuments of antiquity, and gave to the world a valuable work relative to thofe fubjects, entitled "Monumenta Paderbornenfia." He alfo printed at Rome a collection of Latin poems, entitled "Septem Virorum illuftrium Poemata." In this work there were many poems of his own, written with much purity. A magnificent edition of thefe poems was publifhed in the fame year in which he died, at the Louvre, at the expence of the king of France. Moreri.

FURSTENAU, John-Herman, was born at Herforden, in Weftphalia, in the month of May, 1688. Having paffed through his early ftudies in his native town, he commenced his courfes of medicine in Saxony at the age of eighteen, and attended with diligence the fchools of Wittemberg, Jena, and Halle, and became a licentiate in medicine in the laft mentioned univerfity. About 1709 he returned to Herforden, and immediately obtained a confiderable fhare of practice; but having conceived the defign of vifiting the Low Countries, he commenced his journey in 1711, in order to hear thofe great mafters of his art, who at that time flourifhed fo numeroufly in the cities of Amfterdam, Leyden, Utrecht, the Hague, Delft, and Dordrecht. Having profited much by their inftructions, whether in the chair, in hofpitals, or in private communication, he returned to his native place at the end of a year, and recommended the practice of his profeffion with the fame ardour as when he quitted Halle, but with more knowledge and greater refources. Neverthelefs he again interrupted his practice by another journey in 1716. He married in 1717, with the intention of fettling at Herforden; but Charles I. landgrave of Heffe, caufed him to remove thence, in order to take an appointment in the univerfity of Rintlen, where he became a profeffor in 1720. He died at Rintlen on the 7th of April, 1756, at the age of 68 years. He left feveral works: the firft of thefe was frequently re-printed, and bears the title of "Defiderata Medica." It includes alfo "Defiderata Anatomico-Phyfiologica; Defiderata circa morbos et eorum figna; Quæ defiderantur in Praxi Medica; Defiderata Chirurgica." 2. "De Fatis Medicorum, Oratio Inauguralis," 1720. 3. "De morbis Jurifconfultorum Epiftola," 1721. 4. "De Dyfenteria alba in puerpera Differtatio," 1723. 5. "Programmata nonnulla, tempore Magiftratûs Academici impreffa," 1724 and 1725.

Furstenau, in *Geography*, a town of Germany, in the bifhopric of Ofnabruck; 15 miles N.N.W. of Ofnabruck.—Alfo, a town of Saxony, in the margraviate of Meiffen; 3 miles S. of Lauenftein.—Alfo, a town of Pruffia, in Pomerania, 8 miles N. of Marienburg.—Alfo, a town of Silefia, in the principality of Breflau; 15 miles S.W. of Breflau.—Alfo, a town of Germany, in the county of Erbach, on the Mumling; 4 miles N. of Erbach.

FURSTENBERG, a town of Germany, in the county of Waldeck; 10 miles N. of Waldeck.—Alfo, a town of Germany, in the principality of Furftenberg, with an ancient caftle, which gives name to an ancient family, princes of the empire; 14 miles N.N.W. of Schaffhaufen. N. lat. 47° 57′. E. long. 8° 27′.—Alfo, a principality of Germany, in the circle of Swabia, founded in the 13th century, and divided into feveral branches, all of which are extinct except that of Stuhlingen.—Alfo, a town of Germany, in the bifhopric of Paderborn; 2 miles N.E. of Wevenburg.—Alfo, a town of Lufatia, on the Oder; 13 miles S. of Francfort on the Oder. N. lat. 52° 7′. E. long. 14° 48.—Alfo, a town of Germany, in the duchy of Mecklenburgh, on the Havel; 10 miles S.E. of Strelitz. N. lat. 53° 10′. E. long. 13° 14′.

FURSTENECK, a town and caftle of Germany, in the bifhopric of Fulda; 13 miles N. of Fulda.

FURSTENFELD, a town of the duchy of Stiria, on the confines of Hungary, near the conflux of the rivers Feiftritz and Laufnitz; 30 miles E. of Gratz. N. lat. 47° 3′. E. long. 15° 59′.—Alfo, a town of Germany, in the New Mark of Brandenburg; 10 miles N. of Cuftrin. N. lat. 52° 48′. E. long. 14° 42′.

FURSTENWALDE, a town of Germany, in the Middle Mark of Brandenburg, on the Spree; 26 miles E. of Berlin. N. lat. 52° 22′. E. long. 14° 8′.—Alfo, a town of Saxony, in the margraviate of Meiffen; 2 miles S. of Lauenftein.

FURSTENWERDER, a town of Germany, in the circle of Upper Saxony, between the Damfee and Wahrenfee, in the Ucker Mark of Brandenburg; 10 miles W.N.W. of Prenzlow. N. lat. 53 23′. E. long. 13 36.

FURTH, a town of Lower Bavaria, on the Champl; 56 miles N.N.W. of Paffau. N. lat. 49 17′. E. long. 12 42′.—Alfo, a town of Germany, in the circle of the Lower Rhine; 6 miles S.E. of Heppenheim.—Alfo, a town of Germany, in the principality of Anfpach, on the Rednitz; large and well-peopled, with a number of artifans. In this town the Jews have a fynagogue and a printing-office; 4 miles W. Nuremberg.

FURUM, a fmall ifland in the Baltic, near the E coaft of Sweden. N. lat. 57 17′. E. long. 16 32′.

FURUNCULUS, (from *furo*, to rage, on account of the violent inflammatory fymptoms which precede fuppuration,) a term, in *Surgery*, fignifying what is more commonly called a boil, which is well known to be a circumfcribed, very prominent, hard, deep red, exceedingly fore, inflammatory, little fwelling, fcarcely ever becoming larger than a pigeon's egg, and, in general, being confiderably fmaller.

The tumour, as Mr. Pearfon has defcribed, generally appears under the figure of a cone, the bafe of which is a good deal below the furface, while the apex is feldom much elevated above the level of the fkin. Upon the moft prominent part of the boil there is commonly a whitifh or livid puftule, which is exquifitely fenfible, and immediately under which the abfcefs is fituated. For the reader fhould underftand that it is the difpofition of a boil to enter into an imperfect kind of fuppuration, which alfo takes place with remarkable flownefs. The matter contained in the fwelling is fmall in quantity, mixed with red globules, and furrounded by a floughy fubftance, which forms a fort of cyft.

In ordinary cafes, only one boil occurs on the fame fubject, but fometimes many fuch tumours are met with on the fame patient. This is faid to happen more particularly on children, and after the termination of fome acute difeafe.

A boil is feldom fo afflicting a complaint as to require the attendance of a furgeon, unlefs when the fwelling is above the ufual fize, or there are feveral affecting the fame patient, and producing febrile fymptoms.

We may obferve that the furunculus is a complaint which is much more common in children and young perfons than in people more advanced in life. One may infer from this circumftance, and from feveral of thefe tumours often occurring on the fame patient, that the caufes are of a conftitutional defcription, although their exact nature feems involved in obfcurity.

The chief indications in the treatment are, in general, to promote fuppuration, to make a free and early opening with a lancet, and to prefs out the matter and floughs. The poultice may then be continued two or three days longer, at the end of which time any fimple dreffing will ferve to complete the cure.

In the majority of cafes it would only retard the termination of the complaint to attempt to bring about a refolution of the inflammation, fo great is the tendency to that kind of fuppuration which we have above defcribed. Some authors allow, however, that a few inftances do occur in which fuch

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an endeavour may very properly be made, by applying a mixture of honey and vitriolic acid, or elfe fpirit of wine or camphorated oil.

For the moft part fuppuration is to be promoted, and then the beft application is a fmall linfeed poultice.

If the furgeon were to wait events, a fmall opening, inadequate to the difcharge of the matter and floughs, would be fpontaneoufly formed after a confiderable time. Hence, the advantage of taking an early opportunity to make a free opening with a lancet, after doing which, as much of the contents of the fwelling fhould be preffed out as can be done without producing too much pain. It is always proper, in this, as in every other inflammatory cafe, to adminifter gentle aperient medicines, and alfo febrifuge ones, when any fever prevails.

When any induration remains after the fore is healed, the part fhould be rubbed with a little mercurial ointment.

Some furgical writers defcribe a chronic fpecies of boil, which, they fay, is frequently met with in fubjects who have feverely fuffered from the fmall-pox, meafles, lues venerea, fcrofula, or ufe of mercury. (See Munnick's Praxis Chirurgica, cap. 3. p. 19.) Mr. Pearfon ftates, amongft other circumftances, that this kind of furunculus is commonly fituated on the extremities; that it is not attended with much pain, nor any material difcolouration of the fkin, until fuppuration is a good deal advanced; that maturation is feldom completed in lefs than three or four weeks; that the contents of the tumour are a thin fanies; and that, when the fwelling is large, and fuppuration has been very flow, a good deal of cellular fubftance will be difcharged in the form of floughs, leaving a very deep cavity. (See Principles of Surgery, p. 72—73).

There can be no doubt, that, in this laft cafe, the large quantity of gangrenous mifchief might be prevented by making a free and early opening in the tumour with a lancet. This maxim cannot be too ftrongly infifted upon in every inftance of anthrax and troublefome boils.

We agree with Mr. Pearfon, that bark and opium may fometimes prove ufeful to patients labouring under very painful floughy boils; but we regard his precept to apply the hydrargyrus nitratus ruber to the gangrenous cavity, as only deferving of univerfal condemnation. The pernicious cuftom of cramming any abfceffes with red precipitate met with the juft reprobation of that diftinguifhed practitioner, Mr. Pott, who expofed the abfurdity of the practice in his treatife on the fiftula in ano, and we confidently believe, that, in the prefent improved ftate of furgical knowledge, Mr. Pearfon may offer the above bad advice without the leaft danger of its being followed. If he could turn one apothecary's apprentice into an advocate for fuch employment of the red precipitate, we confefs that we fhould be fomewhat furprifed; for, although an author may fet up for a dogmatift, and deliver an erroneous affertion with all the formality of the hundred and twenty-fifth aphorifm, the counfel, if very abfurd, will only be refpected till the deluded ftudent happens to open another furgical book.

Furunculus, in *Zoology*, the name given by many authors to the ferret, called alfo the *furo* and *ictis*. See Mustela *furo*.

FURUO, in *Geography*, a fmall ifland in the N. part of the gulf of Bothnia. N. lat. 65° 40′. E. long. 22° 24′.

FURUSUND, an ifland in the Baltic, belonging to Sweden. N. lat. 59° 46′. E. long. 18° 45′.

FURZE, in *Botany*. See Ulex.

Furze, in *Agriculture*, a fort of low fhrubby plant, of a very hardy nature, and which is armed with prickles. By fome botanical writers it is known under the name of *genifta fpinofa*, and by others under that of *ulex europæus*, and provincially it is often termed *whin* or *gorfe*. It will grow well on moft kinds of poor dry foils, and it propagates fo rapidly by the feeds, that, where once eftablifhed in a fpot of ground, it foon overfpreads the whole fpace; for, as the feeds ripen, their pods are opened by the warmth of the fun, and they are thrown out to a confiderable diftance all around, where they vegetate, and foon fill the ground with young plants.

It is probable that this plant may, in fome fituations, and under particular circumftances, be cultivated to advantage for the feeding of horfes and ftore cattle, on light, poor, fandy, dry foils, which cannot be employed in the growth of grain, or crops of green vegetables. This method of making ufe of furze has prevailed for a confiderable length of time, both on the continent and in fome parts of this kingdom, as in the more northern parts of Scotland.

Where furze is raifed on purpofe for the food of cattle, and efpecially on foils like the above-mentioned, their feeds fhould be fown in February, March, or April, and the ground be prepared as for barley. Six pounds of feed are fufficient for an acre of land; being but lightly covered over. The young plants muft be preferved from cattle during the firft year, and they will be fit to mow or cut in the next. The following methods of cultivating this plant, with the view of converting it to the feeding of animals, have been found by Dr. Anderfon to be the moft fuccefsful on the better kinds of land. A field of a good, dry, loamy land, being well prepared, he fowed, along with a crop of barley, the feeds of the whin in the fame way as clover is ufually fown, allowing at the rate of from fifteen to thirty pounds of feed to the acre. The feeds, if harrowed in, and rolled with the barley, quickly fpring up and advance under the fhelter of the barley, during the fummer, and keep alive during the winter. Next feafon, if the field has not a great tendency to run to grafs, fo as to choke them, they advance rapidly after Midfummer, fo as to produce a pretty full crop before winter. This you may begin to cut with the fcythe immediately after your clover fails, and continue to cut it as it is wanted during the whole of the winter; but it is fuppofed, he fays, that after the month of February the tafte of this plant alters, as it is in general believed that after that time horfes and cattle are no longer fond of it. It is however obferved, that never having had a fufficiency of whins to ferve longer than till towards the middle of February, or beginning of March, he cannot affert this fact from his own experience. He has frequently feen horfes beating the whins with their hoofs fo as to bruife the prickles, and then eat them, even in the months of April and May; and he fays, that fheep which have been ufed to this food certainly pick off the bloffoms and the young pods at that feafon, and probably the prickles alfo; fo that it is poffible the opinion may only be a vulgar error without any foundation in truth.

This is, the writer thinks, the beft way of rearing whins as a crop for a winter food for cattle or horfes. But for fheep, who take to this food very kindly when they have once been accuftomed to it, lefs nicety is required; for, if the feeds be fimply fown broad-caft very thin (about a pound of feed per acre), upon the pooreft foils, after they come up the fheep of themfelves will crop the plants, and foon bring them into round clofe bufhes, as this animal nibbles off the prickles one by one very quickly, fo as not to be hurt by them. Sheep, however, who have not been ufed to this mode of browfing, do not know how to proceed, and often will not tafte them, but a few that have been

been ufed to the food will, the writer obferves, foon teach all the reft how to ufe it.

And another very economical way of rearing whins, but which he has feen practifed, rather than experienced himfelf, is this. Let a farm be inclofed by means of a ditch all round, with a bank thrown up on one fide; and if ftones can be had, let the face of that bank be lined with the ftones, from bottom to near the top; this lining to flope backwards with an angle of about fixty or feventy degrees from the horizon. Any kind of ftones, even round ones gathered from the land, will anfwer the purpofe very well: upon the top of the bank fow whin feeds pretty thick, and throw a few of them along the face of the bank. Young plants will quickly appear. Let them grow for two years, and then cut them down by means of a hedge-bill, ftripping down by the face of the bank. This mode of cutting is very eafy; and as the feeds foon infinuate themfelves among the crannies of the ftones, the whole face of the bank becomes a clofe hedge, whofe fhoots fpring up with great luxuriance. If another ditch be made on the other fide of the bank, and if this be managed in the fame way, and the hedge cut down only once every fecond year, (and in this way it affords very good food for beafts,) the infide and outfide being cut down alternately, the fence will at all times continue good, as the hedge at the top will at all times be complete. This mode of rearing whins is, he remarks, both convenient and economical. But where ftones cannot be obtained for making the facing, the bank very foon moulders down, and becomes unfit for the purpofes of a fence. This will alfo often be the cafe where ftones are made ufe of when the foil is of a loofe nature.

Various circumftances have, the writer fays, prevented him from afcertaining what is the weight of the crop that may be thus obtained; but he thinks he may fafely venture to fay that it is at leaft equal to that of a crop of green clover; and if it be confidered that this affords a green fucculent food during winter, on which cattle can be fatted as well as on cut grafs in fummer, it will, he thinks, be admitted, that it muft be accounted even a more valuable crop than clover. After being cut, he alfo remarks that it fprings up the following feafon with greater vigour than before; and, in this fituation, acquires a degree of health and fucculence very different from what it is ever obferved to poffefs in its natural ftate. He has feen fhoots of one feafon near four feet in length. The prickles too are fo foft, and the ftones fo tender, that very little bruifing is neceffary; indeed horfes, that have been accuftomed to this food, would eat it without any bruifing at all: but cattle, whofe mouths feem to be more tender, always require it to be well bruifed. How long crops of this fort may continue to be annually cut over, without wearing out, he cannot fay; but he believes a long while, in favourable circumftances; however, one thing is neceffary to attend to in order to guard againft its being deftroyed. As, during the beginning of the feafon nature feems to be folely employed about the work of fructification only, and it is not till near Midfummer that the whin begins to pufh forth its wood-bearing branches, which advance with great luxuriance only during the latter part of the feafon, it may happen that if care be not taken to have the grafs that fprings upon the field before the whin begins to fend out its fhoots eaten clofe down, that grafs will acquire fuch a luxuriance before the young branches of the whin begin to advance, as to overtop them, and choke them entirely. Whoever, therefore, has a field under this particular crop muft, he fays, be careful to advert to this circumftance; or, if the field be in good heart he will infallibly lofe it. The field therefore fhould be kept as a pafture, as bare as poffible during the beginning of the feafon, and the cattle fhould only be taken from it when the fhoots of the whin are difcovered to begin to advance with vigour. Under this management, he prefumes it may be kept for many years, and yield full crops: but unlefs the mowers be particularly attentive, at the beginning, to cut it as low as poffible, it will very foon become impoffible to cut the field with a fcythe, as the ftumps will foon acquire fo much ftrength as to break the fcythe when it happens to touch them in any ftrong part.

It has been remarked, in a paper in the ninth volume of the Annals of Agriculture, that by cutting a part of the ground down in this way, every third year, very large crops may be obtained. It is alfo probable, that the plants may continue longer. October is the proper time to begin mowing or cutting them. They continue to fhoot till Chriftmas, and are fit for ufe until March. Horfes are faid to eat them as readily as they do hay, after they have been chopped with a cleaver, and bruifed or pounded by a mill, or otherwife, fo as to take off their fharp points; and it is faid, that an acre of ground will produce ten or fifteen tons of this fodder, and that it will go as far as an equal quantity of hay. Some mix the bruifed furze with chopped ftraw; an hundred of ftraw to a ton of furze; but in whichever way employed, only the growth of the year fhould be cut for the cattle to feed upon.

It has been further remarked, by Dr. Anderfon, that he knows few plants that deferve the attention of the farmer more than the whin. Horfes are particularly fond of it, fo much fo, that fome perfons think they may be made to perform hard work upon it, without any feeding of grain; but he thinks it tends more to fatten a horfe than to fit him for hard labour, and that therefore fome grain fhould be given with it where the work is fevere. Cattle, he fays, eat it perfectly well when thoroughly bruifed, and grow fat upon it as upon turnips; but unlefs it be very well bruifed for them they will not eat it freely, and the farmer will be difappointed in his expectations. Cows that are fed upon it yield nearly as much milk as while fed upon grafs, which is free from any bad tafte; and the beft winter-made butter he ever faw was obtained from the milk of a cow that was fed upon this plant. This food fhould be made ufe of foon after being prepared. Two bufhels, with a proper allowance of hay, have been found to be fufficient for a day, for three horfes, performing the fame labour as with corn. It alfo feemed ufeful to horfes labouring under broken-wind and greafe. Poor hungry gravelly foils, which would not have let for five fhillings the acre, have alfo been rendered worth twenty fhillings, by fowing them with furze-feed, in places where fuel has been fcarce; this being frequently ufed for heating ovens, burning lime and bricks, and alfo for drying malt; but it is not worth cultivating in countries where fuel of any kind is cheap, or upon fuch lands as will produce good grafs, corn, or other crops employed as the food of animals.

It was formerly much the practice to fow the feeds of the common furze, in order to form hedges round the fields; and where the foils were light, the plants foon became ftrong enough for a fence againft cattle: but as thefe hedges are apt to grow naked at the bottom, in a very fhort time, and the plants too frequently fail, fo as to leave confiderable gaps, and are alfo liable to fpread their feeds over the neighbouring fields, the cuftom has of late been greatly in difufe.

Where, however, this practice is attempted, the fpecies commonly known by the title of the French furze is the beft for the purpofe, as it thickens more near the ground, and

and grows to a greater height. This ſort begins to blow about the middle of January, and continues in bloſſom all the ſummer; while the Engliſh furze does not blow until towards the end of the ſpring, and finiſhes its bloſſoming at the ſame time as the other.

It has been ſtated by Mr. Young, that Dr. Taylor, in Surrey, has a poor field of ſix acres, worth about ſeven ſhillings an acre, which is ſown with furze, and by that means converted to one of the moſt profitable on the farm: the land being cleared from couch in April 1782; mown in 1784 to thicken it; and cut for the firſt crop in 1786, and ſince that period regularly every two years, three acres per annum. The laſt year's cut of three acres produced ſeven thouſand ſeven hundred faggots, which ſold at 3*l.* 3*s.* the thouſand on the ſpot, which is 24*l.* 5*s.* 6*d.*; cutting and binding, one ſhilling and ſixpence the hundred, or 5*l.* 15*s.* 6*d.*; clear return 18*l.* 10*s.* Suppoſe tithes, rates and fences to equal 5*s.* rent 7*s.*, in all 12*s.*, or for three acres 1*l.* 16*s.*, this further charge deducted from the above leaves a net profit of 16*l.* 14*s.*; or per acre 5*l.* 11*s.* 4*d.*; and per acre per annum 2*l.* 15*s.* 8*d.*, which is, the writer ſuppoſes, a greater net profit than any man receives from wheat, upon ſuch ſorts of land. It is likewiſe further ſuggeſted, that the doctor ſuppoſes the produce rather increaſes than diminiſhes. In regard to the time of cutting, it is recommended as the beſt ſeaſon to perform it in dry weather in February, or the beginning of March, when the ſevere froſts are over, and there is no danger of the furze plants being injured by them.

It is not unfrequently neceſſary, in bringing waſte lands of the moor kinds into the ſtate of cultivation, to extirpate theſe plants, which is often difficult to perform. The beſt method is probably by very deep ploughing, ſo as to effectually eradicate them. As the ſeeds lie in the ground for ſome time without being injured, young plants will occaſionally make their appearance, but theſe in general readily give way to the ſubſequent ploughings and harrowings.

Furze-*grounds*, thoſe portions or ſpots of ground that are deſtined for, or covered with furze. There are many extenſive tracts of land which are wholly covered with this ſort of plants. The author of the Rural Economy of Yorkſhire ſtates it as the opinion of a perſon of great experience, that old furze grounds, from which fuel has been repeatedly carried, and which are much depauperated, may in general be readily improved in this way: Firſt let the furze be grubbed up; then ſow graſs ſeeds on the grubbed ſurface, without ploughing; and let the land remain in this ſtate until it has acquired a degree of firmneſs, the ſmaller roots left in it being decayed, and the ſurface become covered. Then ſod-burn and lime it, &c. breaking it up for a courſe of arable crops; cloſing it with cultivated graſs. Should the furze begin again to grow and be troubleſome, the proceſs of paring and burning muſt be repeated, as in the former caſe. In this way the furze may ſoon be completely deſtroyed.

Such furze grounds as are intended to be cut over for cattle food, muſt be managed in the manner that has been directed in ſpeaking of furze. See Furze.

Furze-*mill*, in *Rural Economy*, is a mill, or machine, conſtructed for the purpoſe of cruſhing or bruiſing furze, in order to its being employed in the feeding of horſes, and other animals. Several different contrivances have been had recourſe to at different times in this view; but we believe that formed by a large ſtone, on the principle of the cyder mill, is the moſt effectual in performing the work.

A mill for this purpoſe may likewiſe be ſeen at the Board of Agriculture, which is ſaid to anſwer well in performing the buſineſs.

The method of conſtructing a mill for this purpoſe, and the manner of employing it, have been fully deſcribed and pointed out in the fifth volume of the Tranſactions of the Bath Agricultural Society. The writer remarks that it conſiſts of a large circular ſtone ſet on its edge (the weightier and bigger the better), with a wooden axis paſſing through its centre. One end of this axis is fixed upon a pivot placed in the centre of a circular area, and to the other end of it is fixed a yoke, to which the horſe that is to move it is attached. The ſtone being placed on its edge, when the horſe moves, it revolves round its axis in a circular groove, or ſtone trough, (this trough ſhould be made of hewn ſtone,) exactly in the ſame manner as a ſugar-baker's, or a tanner's mill. The whins being placed in this trough, are bruiſed by the weight of the ſtone as it paſſes over them; and being raiſed up by a three-pronged fork by the attendant, after they have been well flatted down, they riſe in a ſort of melted cake, which, being ſet in ſome meaſure upon its edge, is again ſmaſhed down by the wheel or ſtone as it revolves. In this way the operation is continued, by ſucceſſively preſenting new ſurfaces to the action of the wheel, till the whole is reduced into a ſoft pulpy maſs, that can eaſily be eaten by the animals to which it is to be preſented. During the continuance of this proceſs, it is neceſſary, the writer obſerves, to pour plenty of water upon the whins, at different times, without the help of which they can ſcarcely be reduced to a pulp ſoft enough. On this account it will be proper to make choice of a place for the machine, where plenty of water can be obtained with little trouble. It follows alſo, that, as rain can never be prejudicial to this operation, it may be placed in the open air with propriety and advantage.

And as the operation is greatly facilitated, by a judicious way of raiſing or turning the whins, during the performance of the work, which experience will enable any attentive perſon to attain, but which cannot be taught by words only; the writer would adviſe any perſon who ſhould think of erecting an apparatus of this ſort, to put one of his moſt ſagacious ſervants to conduct this operation at the beginning, as ſuch a perſon will more quickly diſcover the circumſtances that facilitate the proceſs, than one of a ſlower comprehenſion. After he has become expert at the buſineſs, he will be able to inſtruct an inferior perſon, who may then be employed for the purpoſe. But in whatever way it ſhall be conducted, the perſon who begins this manufacture muſt lay his account with performing very little work for ſome time at the firſt, in compariſon of what he will be able afterwards to execute with eaſe, and in a more perfect manner.

It is ſuggeſted, that where the whins that are to be employed for this purpoſe grow naturally in the ſoil in irregular buſhes, it is a troubleſome work to cut and gather them. To underſtand the proper mode of managing this buſineſs in all its departments, it is, the writer thinks, neceſſary to advert to ſeveral particulars in the natural economy of this ſingular plant. Inſtead of leaves, the whin is furniſhed with an innumerable quantity of prickles. Theſe ſpring out from every part of the young ſtem, and are, at the firſt, like the ſtem itſelf to which they adhere, ſucculent, ſoft, and inoffenſive; but, like the ſtems alſo, they become gradually harder as the ſeaſon advances, and ſeem, indeed, to a caſual obſerver, to form a part of that ſtem, though they are as different from it as the leaves of other trees are from the branches which produce them. Theſe prickles do not, the writer obſerves, like the leaves of moſt deciduous trees, fall

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it at the approach of winter; but, like evergreens, they remain upon the branches all winter, and retain, during that time, their full fucculence and verdure. Early in the fpring innumerable bloffoms fpring out around thefe prickles, adhering to them, and not to the ftem. The bloffoms are fucceeded by pods containing the feeds, which gradually ripen; a little after Midfummer the feeds harden, and the pods flowly become dry and wither, the prickles to which they adhere becoming dry and withered at the fame time, and gradually loofen from the ftalk, which ftill continues frefh, though it has now attained a woody confiftence. Thefe prickles, having now performed all the functions that nature had defigned them, fall off in part, at firft from the ftalk, and in part adhere to it for fome time, till they are gradually fhaken off by the agitation of the wind, or other caufes. Hence it happens, that it is only the furface or top twigs of a whin bufh that are green, foft, and fucculent; the ftems below being dry and woody, and frequently covered with dry prickles, that are not only not ufeful as food for cattle, but rather hurtful to them, on account of the hardnefs of their confiftence, and fharpnefs of their prickles. In gathering whins, therefore, for food for cattle, they are only the tender top fhoots that are wanted; and the eafieft method of gathering them that our practice has yet difcovered, is to take a forked ftick in the left hand (the readieft thing is the branch of a tree of a proper fize) and a fickle in the right hand (both hands, but more efpecially the right, fhould be armed with ftrong gloves); then thrufting the fickle among the young fhoots, and pulling it backward, the forked ftick, when oppofed to them, keeps the branches fteady enough to produce a refiftance fufficient to make the fickle cut them; and as the tops of the whins are intermixed with each other, they ftick to the prongs of the fork, which, after it is as full as it can hold, is taken to a fide, and cleared by preffing the whins to the ground and pulling the fork backwards. Thefe little heaps are afterwards forked to a cart, and preffed down by a man walking upon them, having his legs covered with large ftrong boots made on purpofe, and thus are carried home. Where the whins have grown upon a good foil, and have made very vigorous fhoots, they may be thus reaped pretty expeditioufly; but if the foil has been poor, and the fhoots fhort, the expence of this operation is very confiderable; and as thefe fhort whins are, in other refpects, of a very inferior quality to the others as food for beafts, it is only at times when fodder is fcarce and dear that they can be economically applied to this ufe. But by being cultivated in the manner that has been defcribed in fpeaking of furze, the labour may not only be much leffened, but the advantages of this winter food be more fully obtained.

Some, however, in performing this bufinefs, make ufe of a very ftiff fhort fcythe, which is found to execute the work quickly, and in a tolerably perfect manner, when the workman becomes fully acquainted with the method of ufing it.

FUSA, in the *Italian Mufic*, the name of one of the mufical notes, frequently alfo called *caroma*, and by us *quaver*.

FUSANA, in *Geography*, a town of Africa, in Tunis; 28 miles S.W. of Keff.

FUSANUS, in *Botany*, derived from *Fufain*, the French name for Euonymus or fpindle-tree, a genus of the clafs and order *Polygamia Monoecia*, and natural order *Eleagni*, Juff. 75.

Generic character. Hermaphrodite. Cal. Perianth one-leafed, turbinate, half five-cleft (four-cleft, Berg.); clefts ovate-acute, from flat fpreading, with the tips gibbofe-uncinate, fomewhat concave. *Cor.* none. *Stam.* Filaments four, linear, grooved in the middle, a little longer than the germ, inferted into the calyx near it, and occupying the finus of it. Anthers roundifh, compreffed, four-lobed, erect. *Pift.* Germ large, turbinate, almoft inferior, wide at top, from flat fomewhat concave, ftriated, quadrangular, with four hollowed finufes, each on each fide of the germ folitary. Style thick, very fhort, fubquadrangular. Stigmas four, obtufe, cruciform, fmall. *Per.* Drupe.

Male. Cal. &c. as in the hermaphrodite, but the fruit abortive.

Effential character. Herm. Cal. five-cleft. *Cor.* none. *Stam.* four. *Germ* inferior; *ftigmas* four. Drupe. *Male. Cal.* &c. of the former. *Fruit* abortive.

Species, 1. *F. Compreffus*, flat-ftalked F. Linn. Syft. ed. 13. 765. Reich. 4. 330. Ait. Hort. Kew. 3. 433. Thefium Colpoon. Linn. Suppl. 161. Syft. ed. 14. 250. Colpoon compreffum. Berg. Cap. 38. t. 1. f. 1. A tree, with compreffed and anticipital branches. *Leaves* oppofite, obovate, blunt with a point, flat, quite entire, fmooth, on fhort petioles. *Racemes* from the axils of the branches, erect, compreffed, fcarcely longer than the leaves. The number of parts in the flowers four or five. The fruitful tree has a three-leaved involucre at the bafe of the germ with five glands. According to Juffieu, it is a glaucous fhrub, with oppofite branches. The younger does not think it neceffary to feparate it from the Thefiums. Juffieu doubts whether it may not be more nearly allied to the Rhamni. A native of the Cape of Good Hope; introduced in 1756 by Mr. F. Maffon. It is increafed by cuttings, planted early in the fummer in a good loamy earth, in pots, fet in a glafs-cafe or hot bed, fhaded and watered gently till they have ftruck root.

FUSARDE, in *Architecture*, a French word for an aftragal, or fmall convex moulding carved into beads.

FUSEADO, in *Geography*, a town of Naples, in Calabria Citra; 15 miles N.W. of Cofenza.

FUSEE, in *Horology*, is a mechanical contrivance for equalizing the power of the main-fpring of a watch, chronometer, or portable clock, in all its different ftates of tenfion. When a fufpended weight is ufed as the maintaining power of a clock, the cord, gut, or chain, by which it is fufpended, is wound round a cylindrical barrel, that has not the leaft fenfible variation in its diameter; on which account the fufpended power never varies in its intenfity, as it is wound off in its defcent; in this cafe no contrivance is neceffary for equalizing that power, which is already unvarying from its own nature. But a clock with fuch a power is not portable, or at leaft not conveniently fo; a fpring has therefore been adopted to fupply the place of a fufpended weight in portable machines for meafuring time, and as the power of all fprings varies with its diftance from the quiefcent pofition, the power derived from the force of a fpring requires to be modified according to circumftances, before it can become a proper fubftitute for a fufpended weight acting conftantly, by means of its gravitation, with a flow and controlled velocity, fo as to gain no acceffion by acceleration. The firft contrivance, we have faid in another place, was that which was denominated *ftack-freed*, confifting of two fprings, fomehow oppofing each other's action alternately, in a way that has never been well defcribed; but the contrivance called the fufee has been found of permanent ufe in practice, and confequently merits a particular defcription: we cannot, however, convey to our readers a clear idea of the nature and due conftruction of the fufee, without taking into confideration, along with it, the main-fpring, its box, and the chain that connects them. Thefe indeed

indeed, have been generally defcribed under the articles CHRONOMETER and CLOCK; but as the theory, on which the fhape of the fufee depends, has not been adverted to, it is neceffary that we fhould treat the fubject more particularly in this place.

The fteel arbor, that paffes through the fpring-box, has a fquare on its protruding end, on which a ftrong ratchet-wheel is inferted; and a catch, with a fpring preffing on it, fcrewed to one of the plates of the frame of the works, always holds it faft in any pofition given it; fo that the box will turn freely, when urged round, without any motion in its arbor; upon this fixed arbor is a ftud within the box, on which the interior end of the fpring, intended for the maintaining power, is hooked, by a hole made near the extremity of the faid fpring; while the exterior end of the fame fpring is pinned to the fide of the box, the convex part of one fuiting the concave part of the other, and the breadth of the fpring being a gauge for the depth of the box. The diameter of the box depends upon the length and thicknefs of the fpring conjointly; the ftrength of the fpring depends upon its breadth and thicknefs taken together, when of a given length; and the time it will continue to act at once coiling up, or winding, as it is called, will depend partly on its length, and partly on its ftrength, for as the time in which the fufee is made to revolve once muft be guided by the whole time that the machine is intended to go at once winding, divided by the number of effective fpirals or turns on the fufee, when the fpring is either too fhort to admit of the requifite number of turns to correfpond to the fufee, or too weak to actuate the works for the whole time of going, the dimenfions of that fpring will not anfwer the requifite conditions, and muft be changed for one of more fuitable dimenfions. The relative forces of the fpring when coiled up, and when nearly relaxed, muft alfo be afcertained by weights fufpended by the gut or chain, that is, wound round the exterior furface of the barrel; for on the ratio of thefe extreme weights, or powers, depend not only the relative diameters of the oppofite ends of the fufee, but alfo its actual length; the latter of which meafures, we believe, is ufually taken at random, or agreeably to fome propofed model that has no dependence on, or connection with, the ratio of the extreme powers of the identical fpring that is to be adopted; whereas an attention to the ratio in queftion is a condition in the conftruction, that it will appear prefently ought not to be difpenfed with, particularly when the workmanfhip profeffes to be of a fuperior kind.

Conceiving now the main-fpring coiled up in the box, (which operation requires a tool to force it properly in,) with the interior end faft to the fixed arbor, and the exterior end pinned to the fide of the box; let us fuppofe the gut, or chain, faft alfo to the fide of the box, near one of its ends, and wound a few times round the box, the outer end being at liberty; then, fuppofing the fpring that is coiled to be in a comparatively relaxed ftate, preffing againft the concavity of the box, with an effort calculated to unwind itfelf, in this cafe the central part of the box is not filled by the fpring; pull now the free end of the gut or chain, fo as to wind it from the box, while its faft end prevents its flipping off without carrying the box round along with it, as many times as there are folds thereon, and, as the box is faft to the exterior end of the included fpring, this fpring is thus brought round the fixed arbor that holds its interior end, and its folds are gradually brought up to fill the central part of the box, in which fituation its intenfity is increafed, in confequence of its being moved from its quiefcent pofition: remit now the gut or chain, and the barrel will retrograde and wind on the folds again, while the included fpring is relaxing itfelf gradually by a correfponding diminution of power, till it is again in its quiefcent pofition. Thus the power of the fpring, contained in the box, is always difpofed to pull back the box itfelf whenever the hand, or any external force applied to the chain, has pulled it round in a forward direction.

Again, let us fuppofe the free end of the chain, that is fpoken of as having been pulled, to be wound round a cylinder, placed in a frame parallel to the arbor of the box, and made faft to its end, in fuch a manner, that turning the cylinder round on the pivots of its arbor, will wind the chain round it while it is unwound from the box; in this cafe the inclofed fpring is wound up as before, by being drawn towards the centre of its box; and provided its force were the fame in all fituations, or diftances from the quiefcent point, the cylinder in queftion would be a proper fufee for the machine to be actuated by, after it had the great wheel attached to it, and the ufual ratchet for winding applied; but we have faid that the force of the main-fpring is always varying as it relaxes itfelf, after it has been wound up to the centre of the box; therefore the cylinder muft neceffarily be fo changed into another figure, that the place of action of the chain on its furface fhall be more or lefs diftant from its axis of motion, as the law of variation in the force of the main-fpring fhall demand, in order that the force tranfmitted to the train of wheel-work, and through it to the balance or pendulum, may be invariable, or very nearly fo. It is obvious, from this view of the fubject, that the figure of the body, fubftituted for the cylinder in queftion, as a fufee, muft taper according to fome certain law, either by ftraight lines forming the fruftum of a cone, or by curves of fome order, bounding the fides of the faid figure; and that the point of the chain's action fhall recede from the axis of the fufee's motion, as it revolves, in fuch a way, while the force of the main-fpring is diminifhed by its relaxation, or departure from the centre of its box, that the product arifing from the force of the fpring, multiplied by the acting radius of the fufee, fhall be in every fituation the fame; for then the effectual power of the main-fpring, as it regards the train, will be invariable. It can hardly be expected that the workman can determine the exact figure, and proportional diameters of his fufee, by any mathematical rule that may be laid down from the meafurement of the fpring's extreme powers; but for the fake of illuftrating the theory of a fufee's action more particularly, we will prefent the reader with fome rules and calculations on this fubject, propofed by the late Benj. Martin, which are fufficiently comprehenfive to take in all cafes. The figure of the curve, which will form the fuperficies of the fufee, by a revolution about its axis, may be inveftigated as follows: Let B C D, in *fig.* 6. of *Plate* XXXVI. of *Horology*, be the curve, and A L the axis of the fufee produced; let D be the point where the end of the chain is fixed on the fufee, when the clock or watch is down, or the main-fpring relaxed, and B the point where it lies when the fpring is wound up: from the points B and D, let fall the perpendiculars B A and D H refpectively to the axis A L, in which perpendiculars produced, let there be taken A E and H I proportional to the refpective forces of the main-fpring, when acting by the chain at the points of extreme power B and D; through the points E and I, let the right line E I K be drawn, till it interfects the axis produced at K, and from any point C on the curve, let C F be drawn perpendicular to the axis in the point G, then will F G reprefent the acting force of the fpring when the chain is pulling it round on the point C. Now fince the force acting on the firft wheel of the train ought always to be uniformly the fame, and as this force is

always as the product or rectangle of the lines C F × G F, this given quantity may be made $= a\,b$, in which case we shall have $F G = \frac{a\ b}{G C}$. To determine, therefore, the equation of the curve B C D, let K H $= a$, H I $= b$, H G $= x$, and G C $= y$; then because of the similar triangles H K I and G K F, we have H K : H I : : G K : F G $= \frac{a\,b}{y}$; that is, $a : b : : a + x : \frac{a\,b}{y}$; whence we have $a\,a = a\,y + x\,y$, which is the equation of the curve, and which shews it to be that of the *hyperbola* with respect to the space between the curve and its asymptotes. Hence when $x = 0$, then $a = y$, or H K = H D; also when the point G arrives at A, then y = A B; and because E A × A B = I H × H D, we have E A : I H : : H D : A B : : $a : y$: : so is the greatest force of the spring upon the fusee to its least force. Again, because the ordinates H D, A B, &c. are at right angles to A L, the curve B C D is that called an *equilateral hyperbola*, by the revolution of which about its axis A K, or common asymptote, the true form of the solid or fusee is generated, as seen in *fig.* 7.

Our *fig.* 7. contains the substance of three figures, as given by Martin, and the letters of reference are altered, so as to prevent the recurrence of the same letters, which in the original account rendered the references very ambiguous to the reader; $\alpha\,\beta\,\gamma$, $\delta\,\varepsilon\,\zeta$, $\eta\,\theta\,\iota$, and $\kappa\,\lambda\,\mu$, are so many opposite equilateral hyperbolas described about the asymptotes $\nu\,\xi$, and $o\,\pi$ intersecting one another in the centre ϱ. Put $\varrho\,\sigma$ [$= \sigma\,\beta$] $= 1$, then $\varrho\,\beta = \sqrt{2}$ = radius of the circle $\beta\,\theta\,\varepsilon\,\lambda$ touching the four equal hyperbolas in their respective vertices: again, $\varrho\,\tau = \varrho\,\upsilon = \sqrt{\varrho\,\xi^2 + \xi\,\upsilon^2} = 2$ is the distance of the focus of each hyperbola from the centre; and lastly, the parameter $a\,b = \theta\,\lambda$ the diameter of the circle, agreeably to the properties of the hyperbola. It is therefore plain, that the section of any given fusee, $\alpha\,\beta\,\theta\,\kappa$, through its axis $\nu\,\xi$, is determined by two equal arcs $\alpha\,\beta$ and $\eta\,\theta$ of two equal and adjacent hyperbolas, beginning from their vertices β and θ. It is also evident, that, since $\sigma\,\beta$ and $\nu\,\alpha$ do represent the two extreme forces of the main-spring, in every fusee properly made, $\theta\,\beta$ and $\eta\,\alpha$ of the greatest and least ends thereof, must be exactly proportioned to the least and greatest force of the spring reciprocally.

It also follows, that when the proportion of the greatest and least force of the spring is known, or the ratio of $\sigma\,\beta$ to $\nu\,\alpha$ is given, then also the length of the fusee $\nu\,\sigma$ is a given quantity of a determinate length. Lastly, it is evident, that when the length of the fusee and one of the two forces $\sigma\,\beta$ or $\nu\,\alpha$ are given, then the other corresponding force is determinable, and not to be assumed at pleasure.

Having thus determined the geometrical form of the fusee, it may not be unacceptable to the reader to give an illustration of this theory by examples of the different cases. Let us therefore put $\sigma\,\beta = a$, $\nu\,\alpha = y$, and $\nu\,\sigma = x$, and then the equation $a\,a = a\,y + x\,y$ will appear in its proper form; whence if a and y be given to find x, we have $\frac{a\,a}{y} - a = x$; when x is given, or $x = 1$, we have given the ratio of a to y; for then $a\,a = a\,y + y$; consequently $a : y : : a + 1 : a$. When a and x are given, then $\frac{a^2}{a + y} = y$; and lastly, when x and y are given, we have $a^2 - a\,y = x\,y$, and, completing the square, $a = \sqrt{x\,y + \frac{1}{4}y^2} + y$.

The proper denominations for expressing the respective forces, a and y, of the main-spring, may be ounces and fractional parts, which we will suppose to be represented by so many tenth parts of an inch in the measures $\sigma\,\beta$, $\sigma\,\nu$, and $\nu\,\alpha$ of the fusee. These forces may be determined thus; let M N O P be the barrel containing the spring, and let Q N $\kappa\,\alpha$ be the position or direction of the chain or gut upon the barrel and fusee when the spring is wound up; then, supposing the chain disengaged from the fusee, and carried under or behind the barrel, in the direction N Q M to the pulley R, so as to pass over and support the weight S in equilibrio, this weight will express the force of the spring in this situation. In like manner, if T $\theta\,\beta$ be the chain when the spring is down or relaxed, and it be detached and carried under the barrel, in the direction O T P, to the pulley U, so as to pass over it, and to support the weight V, which is just large enough to balance the smallest force of the spring, then $\sigma\,\beta = a : \nu\,\alpha = y$: : S : V.

Case 1.—Suppose the weight S to be 63 ounces, and the weight V to be 21; then $a = 63$ and $y = 21$; or, which is the same thing, $a = 3$ and $y = 1$; hence we find $x = \frac{a\,a}{y} - a = 6 = 2\,a$, that is, when the extreme forces are 3 : 1, the length of the fusee $\nu\,\sigma$ is equal to the diameter of its base or thick end $\beta\,\theta$. When S : V : : 2 : 1 : : $\sigma\,\beta : \nu\,\alpha$, then $x = \alpha$, or $\sigma\,\nu = \sigma\,\beta$; also when S : V : : 3 : 2, then $x = \frac{1}{2}\,a$; and universally if S : V : : $m : n : : a : y : : a + x : a$, then it will be $\frac{m - n}{n}\,a = x$.

Case 2.—Given the length of the fusee $\sigma\,\nu = 6$, to determine the ratio of the forces or weights S, V, which will give the diameters $\theta\,\beta$ and $\eta\,\alpha$ of the opposite ends of the fusee. Since $a^2 = a\,y + 6\,y$ agreeably to the laws of the hyperbola, we have $a : y : : a + 6 : a$; then by assuming the value of a we have that of y thus; suppose $a = 3$, then $a : y : : 3 + 6 : 3 : : 3 : 1$; and in this case the diameter $\theta\,\beta$ is three times the diameter $\eta\,\alpha$; and because $a : y : : m : n$, therefore for any assumed ratio, we have $\frac{n}{m - n}\,x = a$; thus if $m : n : : 2 : 1$, then $x = a$; or if $m : n : : 3 : 2$, then $2\,x = a$; consequently if $x = 6$, we have $a = 12$, and $y = 8$.

Case 3.—Given the length of the fusee, and the greatest force of the main-spring to find the least force of the same. Suppose $x = \sigma\,\nu = 6$, and $a = \sigma\,\beta = 3$, then $y = \frac{a^2}{a + x} = \frac{9}{9} = 1$; so that if S = 63 ounces, we have V = 21; and if $x = a$, then $y = \frac{1}{2}\,a$, or $\theta\,\beta = 2\,\eta\,\alpha$.

Case 4.—Given the length of the fusee, and the least force of the main-spring, to find the greatest. Let $x = 6$, and $y = 1$, then $\sqrt{x\,y + \frac{1}{4}y^2} + \frac{1}{2}\,y = \sqrt{6.25} + .0.5 = 3 = a$, so that if $y = 21$ ounces, the greatest force will be $a = 63$: therefore, in every case, the form and dimensions of the fusee are, or may be, geometrically determined.

But we have yet to shew how the requisite hyperbola $\alpha\,\beta\,\gamma$ may be described, as a pattern for the curve of the fusee. Suppose the extreme forces of the main-spring to be, as we have before assumed, as 63 to 21; then having drawn two lines $\nu\,\xi$ and $o\,\pi$ to intersect at ϱ at right angles for asymptotes, let the angles $\nu\,\varrho\,\pi$ and $o\,\varrho\,\xi$ be bisected by the right line $\tau\,\varrho\,\varepsilon$, continued each way indefinitely. Then having determined the diameter of the base $\theta\,\beta$ of the fusee, take that extent in the dividers, and set it off each way from the centre ϱ in the line $\tau\,\varepsilon$ to τ and ϕ, which points will be the foci of the two opposite hyperbolas $\alpha\,\beta\,\gamma$ and $\delta\,\varepsilon\,\zeta$. In the focus ϕ fix a ruler $\phi\,\chi\,\psi$, so as to be moveable round a pin as a centre at ϕ; then take a thread, as much shorter than

than the ruler as is equal to the diameter $\beta\,\varepsilon$ of the circle $\beta\,\theta\,\varepsilon\,\lambda$, and make one end of it faſt to the end, ψ, of the ruler, and the other to a pin fixed in the other focus τ; then a tracer ſtretching the ſaid thread, at the edge of the ruler at any point χ, will trace the required hyperbola, while the ruler is made to turn on its centre of motion ξ; for in every caſe the difference of the two lines $\psi\,\chi$ and $\tau\,\chi$, taken from any point x in the deſcribed curve, will always be equal to the diameter $\beta\,\varepsilon$, agreeably to the laws of the hyperbolic curve. When the proper curve is thus formed on paper, for any particular main-ſpring, it may be transferred to card-paper, or ſheet-braſs; as a pattern or gauge to be applied to the fuſee-engine, as will be hereafter deſcribed.

Fusee-*engine* is an engine contrived for cutting the ſpiral groove, that winds round the ſolid part of the fuſee, which is formed, as we have ſhewn above, by the revolution of an hyperbolic curve. Various conſtructions of this uſeful engine have been deviſed by different ingenious workmen, but it would be difficult to trace each modification to its reſpective inventor, nor indeed is it a matter of much importance, as the general principle is the ſame in all, namely, the application of a ſliding cutting tool to the ſurface of a revolving fuſee; the different methods of adjuſting and limiting the velocities of the moving parts of the engine, and a proviſion for the ſteadineſs of thoſe motions, have given riſe to various applications of the mechanical powers to produce the ſame ultimate effect. We ſhall lay before our readers a few varieties of the engine in queſtion, ſuch as we deem the moſt uſeful in practice, from an examination of which, it will be obvious to the mechaniſt, that other combinations, to anſwer the ſame purpoſe, might be deviſed without difficulty.

1. *Fuſee-engine acting by means of an inclined Plane.*—The firſt fuſee-engine that we propoſe to deſcribe, and that which, in our eſtimation, is the ſteadieſt in its action, is repreſented by *fig.* 1. of *Plate* XXXVII. of *Horology*, and is that which was formerly uſed by the late Brower, whoſe cutting engine we deſcribed as made by Hindley of York; and we have reaſon to believe that the fuſee-engine before us was contrived by the ſame ingenious mechaniſt. A A is a ſolid block of hard wood, that may lie on a table, or have feet of its own, to ſupport it: B B are two firm iron ſupports ſcrewed to the ſaid block, and bearing the ſtrong triangular bridges C, C; through theſe triangular bridges paſſes a long priſm of ſmooth iron, the end of which is ſeen at D; upon this ſtrong priſm ſtand three upright iron, or ſteel, pieces E, F, and G, formed like the puppets of a lathe, the laſt of which is moveable at pleaſure, and the whole taken together conſtitute a frame very much reſembling that of a lathe: H we will call the mandril, or arbor, that paſſes through circular holes in the puppets E and F, and has a winch, I, to be turned by; the cylindrical piece of ſteel, K, paſſes through the puppet G, and is fixed at any depth in the hole by the lever and ſcrew L, over it, which ſcrew enters the head of the puppet, and preſſes againſt the convex ſide of K, the inner end of which is pointed by a cone, and its outer end has a conical hole drilled in it, by which means the piece, K, may be made to bear either againſt a hole, or a point in any arbor that a fuſee may happen to have; M is a lever with a projecting pin ſcrewed to the interior end of the mandril, ſo as to revolve with it, and the arbor of the fuſee, O, which bears againſt a cylindrical hole at this end of the mandril with one end, and againſt the cylindrical point of piece K with the other, carries a ſecond lever N, ſeen ſeparately in *fig.* 2, which correſponds to what is called a *dog* in a turning frame; this dog is fixed to the arbor of the fuſee, by a ſmall thumb-ſcrew at its lower end, as ſeen in *fig.* 2, and the oblong hole at its upper end receives the projecting pin of lever M, ſo that when this lever revolves with the mandril, the dog and fuſee are carried round at the ſame time. On the projecting parts, P, P, of the puppets, F, G, which have each a triangular hole, is ſupported a ſecond, but a ſmaller priſm, Q, of iron, or ſteel, that may be fixed in any poſition, to the right or left, by ſliding without ſhake in the two triangular and diſtant holes above-named: to this priſm, Q, is fixed a ſliding perforated piece, R, by means of a thumb-ſcrew ſeen under Q, and at right angles to this ſliding piece, R, is fixed faſt a third ſtill ſmaller priſm, S, which conſequently may be fixed over any part of priſm Q, ſo as to be oppoſite the fuſee O, or any part of it; along this third priſm, S, ſlides the upright bearer T, that may alſo be fixed at any diſtance from the end of S by another thumb-ſcrew, which appears under it; the bearer, T, therefore ſlides alſo along the ſecond priſm, Q, whenever the piece, R, is moved in making the adjuſtment for poſition; at the top of this bearer is a ſquare hole of conſiderable depth, in which the cutting tool, U, ſlides without ſhake, and any ſlight preſſure on the handle at U of the cutting tool will apply its cutting point to the ſurface of the revolving fuſee, the winch, I, being turned at the ſame time; but the tool U, or the fuſee, muſt one of them have a lateral motion, otherwiſe the groove cut by the ſaid point would form a circle only on the ſurface of the fuſee; to render the groove ſpiral, therefore, is the buſineſs of the remaining portion of the apparatus.

W X Y Z is a long metallic frame with its ſides made perfectly parallel, ſo as to ſlide without ſhake within the two fixed parallel bars of metal, *a a* and *b b*, which are ſcrewed to the puppets E and F; this frame is counterbalanced by a weight ſuſpended by a ſtring, not ſeen in the figure, that is faſtened to its ſuperior end, before it paſſes over a fixed friction-wheel, not neceſſary to be exhibited; and on the mandril, behind this frame, is a pinion inſerted that acts with the rack, or toothed bar, that is viſible at the middle of the lower part of the frame, to which it is made faſt; hence, whenever the winch, I, is turned, not only the fuſee revolves, but the frame, W X Y Z, aſcends or deſcends, accordingly as the turns are made direct or retrograde: *c d e* is a metallic bar, ſimilar to one of the bars that conſtitutes the ſides of the frame, and is moveable round a pin at *d*, as a centre of motion; the extreme croſs-pieces or end pieces of the frame have each a circular perforation quite through, large enough to admit each a ſcrew through them, of which the milled nuts are viſible near W and Z reſpectively; it is obvious, therefore, that this bar, *c d e*, may be fixed either parallel to the ſides of the frame, or at any given angle of inclination, within the limits of the circular apertures, the edges of which are, or may be, graduated; for when the bar is turned round its centre from its parallel poſition, as in the figure, the thumb-ſcrews will act on its extreme ends, and ſet it faſt. Laſtly a weight, V, is ſuſpended by a cord, going round a fixed friction-wheel on the cheek *a a* of puppet E, and made faſt to the ſecond priſm, Q, at the end near R, ſo as to pull this priſm, and ſurmounted cutting tool, U, towards the inclined bar of the frame, till an elaſtic croſs-bar, *f f*, attached to the end of the ſaid priſm, comes in contact with the ſtraight edge of the inclined bar, in which ſituation the priſm in queſtion will remain at reſt while the frame is at reſt; but when the frame is made to aſcend by the pinion of the winch, the weight, V, preſerves the contact of the elaſtic bar, *f f*, with the ſide of the inclined bar, and deſcending, pulls after it the priſm Q, with its cutting-tool.

the fusee, in the mean time, being made to revolve; it is evident, therefore, that if one hand of the workman turn the winch, I, while the other is pressing gently against the handle, U, of the cutting-tool, a groove will be made on the surface of the fusee of some determined number of revolutions, which shall depend on the quantity of the bar's inclination, that regulates the motion of the prism; and as this inclination is adjustable, a given number of spiral turns may be assigned by adjustment, to a given length of the fusee to be cut. At the same time, as the fusee is not cylindrical, the regulation of the pressure by hand only must be very nice, to make the tool cut the groove of equal depth in every part of the successive revolutions, where the diameter is continually varying its dimensions. To obviate any inaccuracy that is liable to arise from this operation, the French have applied a piece of metal formed into the proper hyperbolic curve, as a guide, or gauge, for the run of the cutting tool, such as is represented by *fig.* 3, which we will describe as adapted to our present engine, though it was applied, according to F. Berthoud, by M. Lelievre to an engine, contrived by him, of a construction nearly similar to the one we are describing, except that the sliding frame moved horizontally, whereas our's moves vertically.

In the figure last named, A B is a brass frame, carrying the cutting tool U, and its supporter T, adapted to the prism Q, in *fig.* 1; but at C, where the cutting point is connected with A B, is a piece of metal formed into an hyperbolic curve, as seen detached at D, near the said figure; this curve, or gauge, is formed by the rules laid down in our preceding article Fusee, and is fixed by a clamping piece, E, with a thumb-screw at the required position, as to depth, while the screws at the ends of A B adjust the lateral position, for the length of the fusee, by means of the oblong holes that allow the whole frame of this figure to slide to the right and left, as occasion may require, before it is finally fixed for action. In this situation of the apparatus, a pin is inserted fast into the stem of the cutting tool near C, so as to be in contact with the edge of the curve; the consequence of which contrivance is, that while the cutting tool goes along with the prism Q, in *fig.* 1, as before described, the pin, resting against the edge of the fixed curve, is pushed outwards at the same time that the tool advances in a lateral direction, along the side of the fusee, and the bottom of the spiral groove thus cut is gauged to a given depth, depending not on the shape of the fusee itself, but of the hyperbolic curve at the edge of the small plate, C, which in fact forms the fusee, at the same time that it is grooved by the cutting point. This contrivance has not, that we know of, been used in England, notwithstanding its ingenuity and practicability, and the reason may be, that, as we have observed before, every particular spring, used as a main-spring, requires its own appropriate curve, and it would be endless to have a curved piece made for every separate fusee that is to be cut by the engine: besides, a spring is rarely found uniform in its variation of force with the variation of tension, throughout its whole time of unwinding; so that, after all, tentative adjustments of the depth of certain spirals, to correspond to the actual force of the spring, at the several states of relaxation, become necessary, to ensure an uniformity of the spring's influence on the train of wheel-work: the tool which our English watch and clock-makers use, to ascertain the proper dimensions of the fusee, when formed and grooved, has been already described among the other Clock *tools*, and may be seen at *fig.* 10. of *Plate* XXI. of *Horology*; and when any particular part of the fusee requires to be diminished, or to have its groove deepened, the fusee is put either into a common turning frame, or into the Fusee *frame*, hereafter described, (*fig.* 3. of *Plate* XXXVIII.) and the cutting point is suffered to run by the guidance of the groove already formed, till the given part is found deep enough, after a repetition of trials, made with the spring properly fixed, as to tension, and wound up to the given part of the fusee that has been altered. Thus every point in the spiral groove of a fusee may be adjusted to the acting force of the spring with which it is to be used; and we beg leave to repeat, that these adjustments of the fusee, by trial of the fusee-tool, ought never to be omitted when a new main-spring is first used in any watch or clock, however old; for as soon might we expect that the expansion of mercury, in a new tube, would correspond to an old scale previously made, as that a new main-spring shall have its extreme and intermediate forces exactly compensated by an old fusee without new adjustments.

2. Fusee-*engine acting by the union of a screw, a double lever, and a pair of wheels.*—The fusee-engine which we now come to describe unites the combined powers of wheel-work, the screws, and the double lever, to modify the respective motions of the fusee and of the cutting tool, in the following manner; A B, in *fig.* 4. of the last plate, is a plate of brass fixed, or otherwise placed on a table, during the act of using the engine now before us; C C and D D are two pair of puppets, respectively screwed to the plate A B, and united respectively by the edge-bars lying on the said plate; the little frame under *fig.* 5, seen there detached, is screwed on the same plate A B, between the two edge-bars, to which it will slide parallel, before it is fixed by its thumb-screw beneath; this small frame receives the fusee between its cylindrical holding pieces E and F, and the piece E is moreover used as a stud for a loose wheel to revolve round; a pin projecting from the plane of this wheel impels a dog, as in our last engine, fixed on the fusee-arbor, to which it communicates motion whenever the wheel revolves; this wheel is impelled by another, placed fast on the tapped arbor, of the winch I, that fits in a hole made in the puppet C, near the winch, and is supported at the other end by a cylindrical piece with a conical point, entering the hole of the other puppet C; whenever therefore the winch is turned, both wheels and the fusee will all revolve, though not all in the same direction, nor yet in the same time, unless the two wheels have like dimensions and numbers of teeth. The perforated cylindrical piece G, which if tapped to receive the screw of the arbor, is prevented from turning round, as the arbor revolves, by a projecting piece below it, that surrounds a fixed strong wire H K, which slides, or is at liberty to slide, in two cocks screwed to the puppets C and C, as seen in the figure; therefore, when the arbor containing the male screw revolves, by means of its winch, the piece G, with the corresponding female screw, is drawn towards the winch gradually, and the regularity of this motion will depend on the due inclination of the threads of the screw, which therefore ought not to be *drunk*, as the workmen call the imperfection in this respect; but the piece G would be at liberty to travel along the whole length of the arbor, if there were no stops at the limited distances: to obviate this, the wheel on the tapped arbor has a pin also, projecting from its plane, and the two sliding pieces L and M will clamp at any given points of the wire just described; near the last named wheel the wire is cranked so as to permit the wheel to pass through its crank in its present position, but when the piece under G slides along the wire till it meets with the clamp L, it pushes the wire altogether before it, till the angular part of the crank falls in the way of the wheel's pin, when all further motion is arrested by the locking of the wheel; a contrary motion will also lock the wheel

wheel by a pin behind the wheel, when the clamp M is acted on, and the diftance of the clamps muft depend upon the length of the fufee to be cut, as we fhall fee more clearly prefently. Above and below the moveable piece G are fixed two ftrong wires N and O, which running parallel to each other, are fo fixed, by a pin paffing along focket P, that they have thereon one common centre of motion, in the manner of a long joint; this focket is attached to the double lever, feen detached at *fig.* 6, with five holes near its centre, and with a fimilar focket at its oppofite end; the cock, which is feen in *fig.* 7, is fixed by a fcrew and fteady pin to the bottom plate A B, beyond the fmall frame E F, and fupports the double lever P Q, by a pin placed in fome one of its five holes, accordingly as the oppofite ends of the lever are to be proportioned to each other, that is, accordingly as the central pin is inferted into the firft, fecond, or third, &c. hole of the double lever. R is a long bar, of equal breadth throughout, that fupports the cutting tool S, and that is at liberty to flide within the puppets D and D without fhake; another pair of ftrong wires, like N and O, are made faft to this bar above and below, which wires have alfo their common centre of motion round a long pin, paffing through the focket Q, at the oppofite end of the double lever.

From this arrangement it is evident, that whenever the piece G is drawn towards the winch, by the revolution of the latter, the wires N and O will make their end of the double lever follow; but as the oppofite end of the faid lever will move in a contrary direction, its wires will draw back the long bar R, and with it the cutting tool, the fufee in the mean time being revolving; hence it is obvious that a little preffure on the handle S of the cutting tool will form a fpiral groove, fuch as was defcribed when we detailed the operations of the laft engine. The number of turns on the fufee may be limited either by altering the central pin between the oppofite levers, or by changing the wheels for others of different ratios, with refpect to their diameters and numbers of teeth, or by both jointly when great nicety is required. We are difpofed to think that the variety of fittings in this conftruction, and the union of different powers, are not calculated to render the motions to be produced equally fteady, particularly when the parts of action have been a little loofened by ufe.

It may not be improper to fubjoin here another method of applying the cutting point to the fufee, which feems calculated to prevent parallax or lateral motion of the point; R, in *fig.* 8, as in *fig.* 4, is the edge-bar bearing the cutter D fixed faft to the upright lever B; this lever is faft on the arbor A, which turns on two pivots at the cocks *a* and *a* fixed to the bar R; then fuppofing D to have a handle like S in *fig.* 4, the motion of the arbor A round its pivots will allow the cutting point to approach, or recede from the fufee, according to the quantity of preffure applied to it in the act of cutting. This conftruction is not fo common as that in *fig.* 4, but muft be more fteady, and would probably cut better if there were a joint where D is made faft to B, to preferve the horizontal pofition of the cutting-tool as it recedes or advances.

3. *Fufee-engine* (*common*) *acting by the union of one fcrew and two fingle levers.*—The fufee-engine reprefented in *fig.* 1. of *Plate* XXXVIII. of *Horology*, is the common engine taken from one of the Lancafhire pattern-books, and is the moft fimple of any; A B C D is a plate of brafs, on which the dove-tailed plate E F flides without fhake, and with but little friction, the fides being perfectly parallel. The axis of the handle is fupported by the bearing pieces A and G faft to the under plate, and has a fcrew cut on it throughout its length between the faid bearing pieces; the thick end H of the lever H I is tapped fo as to receive the fcrew of the axis without fhake, to which it can be adapted by the fcrew at H; this lever has an oblong aperture through it, in the direction of its length from H nearly to I, and is moveable round the pin at K, that enters the lower plate through a fecond aperture at the extreme end of the lever; L M is a fecond lever, turning on the pin M fixed to the fliding plate, and fet faft by the milled nut L, over any point of the circular aperture N, as the inclination may require; O L is an endlefs fcrew of flow motion, for regulating the accuracy of the adjuftment to the point where the nut fixes the lever, and T is a pin fixed in the lever L M, that paffes through the oblong apertures of lever H I, and gives motion to the fliding plate E F, whenever the handle turns the axis of the fcrew, and as the cutting point P Q is attached to this plate, by the cocks R and S, it alfo moves with the fame velocity; this velocity depends on the diftance of the pin T from K the centre of its motion, and may therefore be regulated by the nut L and fcrew O L, to the requifite angular velocity, that may fuit each turn of the handle, or fufee attached to it by a clamping piece between G and D.

The operation of cutting the fufee by this engine, it is prefumed, can require no further explanation.

4. *Fufee-engine* (*old*), *acting by the union of a wheel and pinion, a fcrew, a fimple lever, and a fliding frame.*—*Fig.* 2, of the laft plate, exhibits a perfpective view of the old fufee engine as given in the Lancafhire pattern books; A B C D, as before, is the inferior frame, and E F the fliding frame, but inftead of dove-tailed edges this upper frame flides by means of four cylindrical pieces paffing through correfponding holes in the edges of the lower frame, as feen in the figure; there is alfo an axis formed into a fcrew, turned by the handle, acting in the part H of the invifible lever H I, as before, which lever lies here under the frames; but a wheel G on a feparate axis, that carries the fufee, is actuated by a pinion on the axis of the handle. The fecond lever L M of the preceding engine is here wanting; but the nut T is in place of its pin T, and penetrates one of the circular holes in the fuperincumbent piece R T, fo as to lay hold of the lever H I through a concealed aperture in the fliding frame E F; the diftance of the hole ufed from the centre of the lever's motion K regulates the velocity, as before, of the fliding frame, and confequently of the cutting point P Q, fcrewed to it by a pair of embracing cocks, while the fcrew, taking into the nut R, adjufts the exact fituation of the hole occupied by the milled nut T. In all other refpects the operation of cutting the fufee is the fame as in the other engines. Sometimes we have feen a fcrew acting againft the fliding frame and placed between the cylindrical pieces on the inner edge of the under frame to prevent jerks, but when the fcrew and other acting parts are well fitted, this is unneceffary. From thefe four engines it is eafy to perceive, as we have obferved, that various other modifications may be adopted to anfwer the fame purpofe.

Fusee *Frame.*—When a fufee has been cut by an engine, and is found on trial to have fome place or places of too large a diameter for the main-fpring to act equally with, a little frame, like that in *fig.* 3. of the laft plate, is fometimes ufed, where the cutting tool A has its point put in the fpiral groove, and is made to reft on a cylindrical arbor B, that refts on the equal rollers C and D, fixed in the refpective ends of the frame, by means of a grooved pulley, fo that as the fufee revolves, the faid arbor B moves laterally, and keeps the point of the cutting tool in the groove, at right angles to the arbor of the fufee, and thus any particular part only of the fufee may be reduced, by partially turning the handle, as the circumftances of the cafe may require.

Fusee, *Fuze*, or *Fuse*, in *War.* See Fuze.

FUSHENG, in *Geography*, a town of Persia, in Chorasan, 36 miles N. of Herat.

FUSIBILITY, that quality in metals and minerals, which disposes them for fusion.

Gold is more fusible than iron or copper; but less so than silver, tin, and lead.

Borax is frequently mixed with metals, to render them more fusible.

FUSIFORMIS, Radix, in *Botany*, a spindle-shaped root, as in the carrot, parsnep, and radish. See Root.

FUSIGNANO, in *Geography*, a town of Italy, in the department of the Lower Po; 24 miles S. E. of Ferrara.

FUSIL, in *Heraldry*, by the French called *fusee*, q. d. spindle, is a bearing of a rhomboidal figure, more slender than the lozenge; its upper and lower angles being more acute than the two middle ones.

Fusil, in *Military Language*, is a light musket, nearly similar to a carabine, but in general more neatly finished; it being usually intended for the use of officers attached to light companies, and those appertaining to fusileer corps, to yagers, rangers, chasseurs, carabineers, and others in which light arms are usually employed. Formerly the officers attached to grenadier companies bore fusils, but within these few years that practice has been discontinued, nor do many officers in any corps use them; swords being the only weapons ordinarily borne. The fusils intended for officers are generally mounted with silver, and have bayonets of a light construction; the bore usually calculated for balls of eighteen to the pound, and the length of the barrels from thirty-four to thirty-eight inches. We consider the fusil as being an eligible weapon for all officers whose duty it may particularly be to engage in desultory skirmishes, and especially in that horrid species of warfare, termed "bush-fighting," but for the ordinary branches of service performed by regiments of the line, they are certainly ill calculated, on account of their being cumbrous, and a check upon those active services connected with the preservation of order, and the prompt execution of whatever evolutions may be performed. The espontoon, though by no means a choice implement, is certainly more efficient in keeping the muskets down to a proper level, while it furnishes no insignificant means of defence, especially against a single horseman. For the same reason no serjeants should bear fusils; halberts being in every instance superior. We understand from good authority that non-commissioned, and sometimes even commissioned officers who bear fire-arms, do not attend so much to the preservation of discipline, as they do to the taking aim with their fusils, wherever opportunity offers for "taking a good shot."

Fusil-*man*, commonly called *fugle-man*, is a non-commissioned officer or soldier, whose duty is to give the time for the several motions of the firelock, the facings, &c. performed by any body of men. His post is usually in front, commonly towards the right flank; but common sense points out that it should always be more centrical, especially for whole regiments, the rear ranks of which are often compelled to perform their motions partly by guess, and partly by a rapid adaptation of what they see doing by the front rank. This inconvenience is necessarily increased in proportion to the obliquity or deviation from a central position.

The motions of the fusil-man should, in contradistinction to those of the soldiers in general, be broad, open, and strongly marked. The quitting of a hand should be denoted by forcibly throwing the respective arm upwards, and wide from the body; and the joining a hand should be denoted by the reverse, that is, by throwing the corresponding arm forcibly towards, or across the body. The motion of a foot should be on a similar principle, and all facings should be marked by first raising the right hand and throwing back the right foot, then as the body casts round, restoring them with a sweeping motion to their places. Without such demonstrations, which certainly appear individually ludicrous, no corps could go through their motions with exactness.

FUSILE Column and Marble; see the substantives.

FUSILEER, in *Military Language*. This designation should literally apply to men bearing fusils, but it is in many instances given to regiments which vary but little from the ordinary class of regiments of the line. The duties of a fusileer, properly speaking, are chiefly directed to the same services as appertain to light infantry, and to the several corps performing the more desultory and detached operations of a campaign; consequently the dress ought to be so fashioned as to allow perfect freedom of motion, and not to be subject to hitching among boughs, &c. The colour ought to conform to the general face of the country; thus, where much verdure prevails, green should be adopted; but where the soil is generally barren, any medium shade of brown, or of russet, or of olive colour, will be preferable; since such will tend best to the concealment of those who may be ordered to occupy, possess, &c. for the purpose of surprising, or of annoying an enemy. Fusileers should wear stout shoes, with whole gaiters of substantial but very pliant leather, reaching over the knees, double-milled pantaloons and jacket, without any facings, or glittering buttons; the belts should be of the same colour as the cloth, as ought also the cap, which should be of leather, with flaps to let down both before and behind: every article should be water-proof, and made to fit very compactly, but without deteriorating the freedom of motion. The fusil and the bayonet ought to be browned over all those parts usually kept bright; in order that no rays should be reflected from them. This mode is now very properly becoming very general in the British service, and carries with it the important recommendation of considerably diminishing those minor duties of the soldier which often cannot be executed, and when they can, rarely fail while on active service to trench upon the little rest he may occasionally be able to obtain.

FUSILUS, in *Botany*, a name given by some to the fusanus, a more common name for the euonymus.

FUSILY, or Fusile, in *Heraldry*, is when a field, or ordinary, is entirely covered over, or divided into fusils.

FUSINI, in *Geography*, a town of Japan, in the island of Niphon, 16 miles S.E. of Meaco.

FUSION, the solution or melting of metals, minerals, &c. by means of fire; or the act of changing them from their solid state to a fluor.

The word is derived from the Latin, *fusio*; of *fundo*, *I pour out*. Whence, also, *effusion*, *infusion*, *suffusion*, and *transfusion*; which see.

To give the ore its metallic form, they fuse it; when it is in fusion, the metalline substance, being the heaviest, sinks to the bottom of the furnace; the other terrestrial matters rising, in form of scoria, to the surface.

It is commonly imagined, that the fusion and metalline form of ores is wholly the effect of fire; and we have theories of fusibility founded on this principle; but it is a mistaken one. Fire, no doubt, is the principal agent; but fire, alone, is not sufficient. A mineral, or piece of metal not purified, being put alone in a crucible, melts with great difficulty, and never becomes a perfect metal; copper ore, for instance, being thus applied, its impure part forms a scoria,

ſcoria, and vitrifies; the metalline part reſiding at bottom, under the appearance of a black regulus. To promote the fuſion and ſeparation, they mix coals, or ſtones, or cinders, or old ſcoriæ, along with the ore; the inflammable principle in which, by help of fire, fuſes them perfectly, ſets the heterogeneous part at liberty, and raiſes it to the top. See FLUX.

The general reaſon of fuſion is pretty eaſily aſſigned. The firmneſs or ſolidity of a body ariſes from the force wherewith its particles cohere. And the coheſion of all bodies is as the quantity of contact in the component particles.

Now the corpuſcles of fire, entering with rapidity into the pores of the metal, agitate, and, by degrees, looſen, divide and diminiſh their contact; till at length there is not enough to hinder their rolling over each other, and giving way upon the leaſt impulſe.

The dilatation obſervable in all fuſion, is a proof that the particles of the bodies are ſeparated, and ſet at a diſtance from each other; and, conſequently, their contacts and coheſions diminiſhed.

In effect, rarefaction and dilatation are the neceſſary conſequences of fire and heat.

From the difference of coheſion proceeds that variety we obſerve in the fuſion of bodies; for ſuch as have leaſt contact of parts, ſooneſt give way to the fire; and ſome will melt away by the warmth of a vapour only: thus air and mercury are ſo fuſible, that the heat of the atmoſphere is always ſufficient to keep them fluid; when others, which have a ſtronger contact, are not to be ſeparated without much difficulty. Upon this account, vegetables very eaſily diſunite, minerals ſlower, and metals ſloweſt of all; and of the laſt, thoſe wherein the contact of parts is leaſt, as in lead and tin, moſt readily melt; but thoſe which are moſt compact, as gold and ſilver, are not to be managed but by a violent heat.

If now the force of coheſion were proportional to the quantity of matter, or to the weight of bodies, we might from ſtatics account for all the variety that occurs in fuſion: for by knowing the ſpecific gravity of a body, we ſhould then know what force is required to melt it; but becauſe the ſame quantity of matter may be ſo variouſly diſpoſed, that in one body there ſhall be a much greater contact than in another, though the gravity be equal, or even greater in the latter, therefore the force of the coheſion cannot be eſtimated by gravity; for lead, though more ponderous than all other metals except gold, yet in the fire is more eaſily melted than almoſt any other; ſo that it neceſſarily follows, that in this metal there muſt be a leſs coheſion, or contact of parts, how much ſoever it may exceed others in the quantity of its matter.

Bodies after fuſion return again into a ſolid maſs, upon removing them from the fire; becauſe their particles hereupon approach nearer to one another by their attractive force, and are compelled to unite.

Such as conſiſt of homogeneous and unalterable parts, as wax, gums, and the purer metals, recover their ancient form: for when the ſame texture of parts remains in the whole body, it muſt of courſe re-aſſume the ſame appearance, when the ſeparating power ceaſeth to act; but other bodies whoſe parts with reſpect to denſity and ſurface are extremely different from one another, while ſome are carried off by the force or heat, and others are changed as to figure and poſition, muſt be forced to appear in another form; for they cannot recover their original phaſes, unleſs every particle could reinſtate itſelf in that very ſituation it had before, which may be hindered infinite ways; as may be experienced eaſily in heterogeneous bodies.

The difference, therefore, obſerved even in homogeneous bodies after liquefaction, is no ways to be accounted for but from the changeableneſs of ſurface in their parts: for thoſe bodies whoſe parts conſtantly retain the ſame ſurfaces never loſe their form; but others, by having the ſurfaces of their parts altered, have a different texture, and put on another appearance.

It had been formerly an opinion, very generally received, that the ſolution of metals by lightning is effected by a kind of cold fuſion; and the inſtances that have been uſually alleged in ſupport of this opinion, are thoſe of a ſword being melted in its ſcabbard, and of money being melted in a bag, whilſt the ſcabbard and bag remained unhurt. But it appears, by a variety of experiments and obſervations, collected in the progreſs of electricity to its preſent advanced ſtate, that this kind of fuſion is attended with heat and ignition, as in the caſe of common fuſion. Phil. Tranſ. vol. li. part. i. art. 30 and 31.

FUSIVATA, in *Geography*, a town of Japan, in the iſland of Niphon; 56 miles S.S.E. of Meaco.

FUST, in *Architecture*, the ſhaft of a column; or that part comprehended between the baſe and the capital; called alſo the naked.

The word is French, and literally ſignifies a *caſk*.

The fuſt is that cylindrical part, which makes, as it were, the body or trunk of the column, excluſive of the head and foot.

FUSTIAN, in *Commerce*, a kind of cotton ſtuff, which ſeems, as it were, quilted, or whaled on one ſide.

Manege derives the word from *fuſtanum*, which in the corrupt Latin writers is uſed in the ſame ſenſe, and is ſuppoſed to be formed from *fuſtis*, on account of the tree whereon the cotton grows. Bochart derives it from *fuſtat*, which, in Arabic, ſignifies the ancient city of Memphis, where cotton is produced in great abundance. Right fuſtians ſhould be made altogether of cotton thread, both woof and warp.

FUSTIAN, in the *Manufacture of Cloth*, is a ſpecies of coarſe thick twilled cotton, and is generally dyed of an olive, leaden, or other dark colour previouſly to its being uſed. Beſides the common fuſtian which is known by the name of pillow (probably pilaw) fuſtian, this manufacture, which is chiefly carried on in Lancaſhire, and the weſt riding of Yorkſhire, comprehends the cotton ſtuffs known by the names corduroy, velverett, velveteen, thickſett, and the other thick fabrics uſed for men's wearing apparel. The commoneſt kind of fuſtian is merely a twill of four, and ſometimes five leaves of a very cloſe ſtout fabric, and is very narrow, ſeldom exceeding 17 or 18 inches in breadth. It is cut from the loom in half pieces or ends as they are uſually called, and after undergoing the ſubſequent operations of dyeing, dreſſing, and folding is ready for the market. The end or half piece is generally from 30 to 40 yards.

The draught and cording of common fuſtian is very ſimple, being generally a regular or unbroken tweel of four or five leaves. Below are ſpecimens of a few different kinds ſelected from thoſe moſt general in Lancaſhire.

The number of leaves of heddles are directed by the lines acroſs the paper, and the cording by the cyphers at the left hand corners, thoſe which raiſe every leaf being diſtinguiſhed by the cyphers, and thoſe which ſink them left blank, as more eſpecially explained in the article DRAUGHT and *Cording*.

No. 1.—Pillow Fuftian. | No. 2.—Plain Velveret.

```
| o |   |   |   |  4        5      1   §  |   | o |   |   |   |              3  1
|   | o |   |   |      3       6    2   §  |   | o | o |   |   |          5
|   |   | o |   | 6   2         3       §  | o |   |   | o | o |               2
|   |   |   | o | 5        1       4     §  |   |   |   | o |   |        6  4
  2  4  3  1                                 4  6  2  3  1
                                                  5
```

Of the above each contains four leaves of heddles or healds; that reprefented by No. 1. is wrought by four treddles, and that which is diftinguifhed by No. 2. by five; the fucceffion of inferting the threads of warp into the heddles will be difcovered by the figures between the lines, and the order in which the treddles are to be fucceffively preffed down by the figures below.

No. 3.—Double Jean. | No. 4.—Plain Thickfett.

```
| o |   |   | o |      1                §  |   | o |   |   |   |     8
| o |   | o |   |         2             §  |   | o | o | o |   |          6  4
|   | o | o |   |     3                 §  |   |   |   | o |   |            5   2
|   | o |   | o |  4                    §  | o |   |   | o | o |     7     3   1
  4  2  3  1                                 4  6  2  3  1
                                                5     7
```

Thefe, like the former, are wrought with leaves. No. 3. requires four, and No. 4. five treddles. The fucceffion of inferting the threads of warp, and of working the treddles, are marked by the refpective numbers between and under the lines, as in the former example. Both are fabrics of cloth in very general ufe and eftimation as low priced articles.

No. 5.—Beft Thickfett. | No. 6.—Velvet Tuft.

```
| o |   |   | o | o |          3  1     §  |   | o |   |   |   | 5  3  1
|   |   |   |   | o |    5              §  |   | o | o |   |   |             4  2
|   | o |   |   |   |          2        §  | o |   |   | o | o | 4  2
|   | o | o |   |   |    6  4           §  |   |   |   | o |   |          5  3  1
  6  4  2  3  1                              6  4  2  3  1
        5                                          5
```

Thefe are further fpecimens of what may be, and is, executed with four leaves, and in both examples five treddles are ufed. With two other fpecimens we fhall conclude our examples of this defcription of work, and fhall then add a very few fpecimens of the more extenfive kinds.

No. 7.—Cord and Velveret. | No. 8.—Thickfett Cord.

```
|   | o |   |   |   |      3  1       3  1 §  | o |   |   | o | o |          5  3  1
|   | o | o |   |   |  5        7  5       §  |   | o |   |   |   |           4  2
| o |   |   | o | o | 6      8        2    §  |   |   |   |   |   |     9  7
|   |   |   | o |   |    4  2     6  4     §  |   | o | o |   |   |   10  8  6
  4     2  3  1                               5  4  3  2  1
     6  5
```

In thefe the fucceffion of drawing and working are marked like the former. The next are examples of patterns wrought with fix leaves. No. 9. has eight, and No. 10. five heddles.

No. 9.—Double Corduroy. | No. 10.—Genoa Thickfet.

```
|   |   |   | o |   | o |   | o |            1  §  |   |   |   | o | o |          1
|   | o |   |   |   | o |   |   |         2     §  |   |   | o |   | o |        2
| o | o | o | o | o |   |   |   |      3        §  | o |   | o | o |   |      3
|   |   |   | o |   | o |   |   |       4       §  |   | o |   | o | o |      4
|   | o |   |   |   |   | o |   |    5          §  | o |   | o |   | o |   5
|   | o |   | o |   |   |   |   |  6            §  |   | o |   | o |   |   6
  2  4  6  8  10  12  3  1                           4  2  5  3  1
                      7  5                           8  6  11  9  7
                     11  9                           1  2  10
```

In

In both these the warp is inserted into the heddles the same way. The difference is entirely in the application of the cords and in the succession of pressing down the treddles. We now give four specimens of the species of flushed and cut work, known by the name of velveteen. They are also upon six leaves, and the difference is solely in the cording and in the treading.

No. 11. Queen's Velveteens. No. 12.

	o		o	o		1
		o		o		2
		o	o			3
			o	o	o	4
		o		o		5
o		o	o			6

1 3 12 8 4 2
5 7 6
9 11 10

			o		o	1
		o		o	o	2
			o	o		3
	o		o		o	4
				o	o	5
o			o	o		6

2 4 3 1
6 8 7 5
10 12 11 9

No. 13.—Plain Velveteen.

				o	1
o			o		2
				o	3
		o	o		4
				o	5
	o		o		6

1 3 2 4 8
5 7 6

No. 14.—Genoa Velveteen.

		o	o		o	1
	o	o				2
o	o		o			3
		o	o			4
	o	o		o		5
	o		o			6

2 4 8 12 3 1
6 7 5
10 11 9

The additional varieties of figure which might be given are almost endless, but the limits of this article will not admit a further detail. Those already given are the articles in most general use. The varieties of fancy may be indulged to great extent, but it is universally found, that the most simple patterns in every department of ornamental weaving, are those which attract attention and command purchasers. We shall therefore only add two examples of king's cord or corduroy, two of Genoa and common velvet, and two more of jean. These will be found below.

No. 15.—King's Cord.

				o	o	1
		o			o	2
		o	o			7 3
			o	o		8 4
	o			o	o	5
o		o			o	6

1 3 8 6 4 2
5 7

No. 16.—Dutch Cord.

		o			4 1
	o			o	5 2
o			o		6 3
	o	o			7
o		o	o		8
o	o		o	o	9

6 4 2 3 1
5

No 17.—Genoa Velvet.

		o			o	1
	o	o	o			2
o	o					3
		o	o			4
	o	o		o		5
	o		o			6

2 4 8 12 3 1
6 7 5
10 11 9

No. 18.—Plain Velvet.

						1
						2
						3
						4
						5
						6

1 3 4 2 8
5 7

Miscellaneous Remarks.—In the manufacture of cloth it is difficult to fix upon any generic term for a variety of articles which, however, bear a very near analogy to each other, and are only distinguishable either by a difference in the material of which they consist, or some small variation in the process of manufacture. In this article the word fustian has been used as the generic term, and examples have been given of the most common fabrics of the fanciful varieties of this article. Dr. Johnson contents himself with describing fustian merely as a kind of cotton cloth, which although probably very just, conveys no impression whatever to the mind, excepting, that in its raw state it is a vegetable substance, found in most of the tropical climates, and that when manufactured it serves as a covering for the human body, or for some other domestic purpose.

The examples, short as the article is, will be found to contain an abstract of most of the articles known by the various names of fustian, jean, corduroy, thickset, velveret, velveteen, &c. in the cotton manufacture: of plaiding, blanketing, kerseymere, plum serge, &c. in the woollen, and of satin, &c. in the silk. Of velvet there are properly only two kinds, that with a plain and that with a tweeled, or, as it is here called, a Genoa ground or back. When the material is silk, it is called velvet, when cotton, velveteen, and this is the sole difference. In the same way a common tweeled cloth, when composed of silk, is called satin, when of cotton, fustian or jean, of woollen, plaiding, serge or kerseymere, and in the linen is distinguished by a variety of names according to the quality or fineness, or the place where the article is manufactured. It would tend greatly to simplify an analysis of the various manufactures of cloth, were a general nomenclature introduced, as has been so successfully done, in the more comprehensive and important science of chemistry, and the universal usefulness of the art, as embracing a variety of articles of necessity to the poor, and of ornamental luxury to the rich, would render the attempt very desireable in every respect. But while the knowledge of the art continues to be confined to operative mechanics and to manufacturers, little disposed to study simplicity or arrange and classify ideas, this is rather to be wished for than expected. In all the fanciful branches which form the subject of this article, the cloth undergoes a variety of processes after coming out of the weaver's hands Of these, the first is cutting the flushed warp to raise the pile as it is called. This is performed on a flat table with a sharp pointed knife. It is necessary in this to be careful that the knife may only cut the pile without injuring the back or fabric. I am not aware (says the writer of this article) that any attempt has ever been made to render this either more safe or speedy by the aid of any kind of machinery. It is said, indeed, that in the manufacture of Wilton carpets and hearth rugs, (which are merely worsted velvets,) grooved wires are introduced and cut out in the loom by the weaver, the groove in the wire serving as a guide for the knife, to prevent it from injuring the fabric of the cloth. The next operation is that of dyeing, which depending entirely on the chemical processes necessary to give the greatest possible brilliancy and durability of colour, to the material of which the cloth is composed, forms no part of this article. With little variation in the mechanical part, many kinds of cloth, differing widely in the material and equally so in the texture, are made: but the variety is boundless.

Fustian, in *Criticism*, a word used to express bombast. See Bombast and Frigid.

FUSTIC, Old, as it is called in this country, (the *bois jaune* of the French,) is the wood of a large tree, the Morus *tinctoria*, which grows abundantly in many parts of the West Indies and the American continent. It is of a sulphur colour, pregnant with colouring matter, which is much more durable than any of the other yellow dyes, so that when applied without a mordant, the dye is considerably durable, but still more so when used with the same mordants, as weld or quercitron. The decoction of fustic in water, when strong, has a deep and somewhat dull red yellow, and by dilution becomes orange-yellow. Acids produce in it only a slight precipitate, which alkalies redissolve, rendering the liquor red. Fustic, though valuable on account of the durability of its colour, is seldom used for the pure yellows, as the colour given by it is dull and muddy. It is chiefly used in compound colours, as in forming green with a Saxon-blue basis; or in producing, with a mixed mordant of alum and iron-liquor, an infinite variety of drab and olive dyes, in which case the dullness of its colour is of no consequence. It is chiefly used in general dyeing, and seldom in printing. It goes much farther than weld.

Young fustic, the *fustet* of the French dyers, *Rhus cotinus*, or Venice sumach, is a shrub growing in Italy, and the south of France, which gives a fine greenish yellow without any permanence, so that it is never used alone, but merely as an accessory colour to heighten cochineal and other dyes, and occasion their approach to yellow.

FUSTICK Wood. See Morus *tinctoria*.

FUSTIGATION, in the *Roman Customs*, a punishment inflicted by beating with a cudgel. This punishment was peculiar to freemen; for the slaves were scourged or lashed with whips.

Fustigation, *Fustigatio*, is also a penance enjoined by the Roman inquisition.

FUSTUARIUM, in *Antiquity*, a Roman punishment, the same with fustigation.

FUSTUC, in *Botany*, a name given by some of the old writers to the tree which produces the pistachia-nuts. The word sounds so like the name of a wood used in dyeing, and called at this time *fustick*, that it might be supposed to express some tree of the same kind; but it is of a very different origin. The Jews and Arabians have called the pistachia-tree fistic and fustack, and from thence some have written the name fustuck or fustuc, the Greeks have written it ϕιςακ, and the barbarous Latin writers *fisticio*, which sounds very like the name pistachio.

FUTAK, in *Geography*, a town of Hungary, on the Danube, opposite to Peter-Wardin, situated in a plain, 16 miles S.S.E. of Bacs.

FUT-FA, in *Music*. See F and Clef.

FUTTAGUNGE, in *Geography*, a town of Hindoostan, in Oude; 15 miles S.E. of Fyzabad.

FUTTASING, a circar of Bengal, bounded on the N.E. and E. by Raujeshy and Kishenagur, on the S. by Burdwen, and on the N.W. by Raujeshy and Birboom; of a triangular form, and about 60 miles in circumference.

FUTTEHPOOR, a town, or rather village, of Hindoostan, 23 miles from Agra. It is enclosed with a high stone wall, of great extent, built by the emperor Akber or Acbar. The space within does not appear to have ever been nearly filled with buildings, and the part now inhabited is but an inconsiderable village. This space is divided by a hilly ridge of considerable elevation, which runs nearly from S.W. by W. to N.E. by E., and extends beyond the inclosure, four or five miles on each side. Near the centre of the inclosure, on the most elevated part of the rock, is built the tomb of Shah Selim Chustee, by the efficacy of whose devotion, the empress of Akber, after remaining for several years barren, became pregnant, and bare a son, named Selim in honour of the saint. The approach to this mausoleum is magnificent,

magnificent, and impresses the mind of a spectator with sensations of sublimity. On the same ridge is an ancient palace of Akber. Mr. Hunter, in his return from Oujein to Agra, visited this place, and has particularly described it. Asiatic Researches, vol. vi. p. 75, 8vo.

FUTTIAPOUR, a town of Hindoostan, in Bahar; 24 miles S.S.W. of Patna.

FUTTIGUR, a town of Hindoostan, in Oude; 5 miles S. of Furruckabad.

FUTTIPOUR, a town of Hindoostan, in Oude; 30 miles S.E. of Corah.—Also, a town in Bahar; 40 miles N.N.W. of Durbungah.—Also, a town of Bahar; 13 miles S.S.E. of Durbungah.—Also, a town of Bahar; 18 miles N.E. of Coprah. N. lat. 26° 3'. E. long. 83° 8'.—Also, a town of Allahabad; 27 miles N.W. of Currah. N. lat. 25° 58'. E. long. 81° 13'.—Also, a town of Bengal; 12 miles N. of Nangora. – Also, a town of Bengal; 56 miles N.E. of Purneah.

FUTTOCKS, in a *Ship*, the timbers raised over the keel, or the compassing timbers which make her breadth.

Those next to the keel are called ground-futtocks, and the rest upper-futtocks.

FUTTOCK *Shrouds*. See SHROUDS.

FUTURE, something to come hereafter.

We say a future state, a future contingency; there is none but God to whom future things are present.

FUTURE, or FUTURE *Tense*, in *Grammar*, denotes an inflexion of verbs, whereby they denote, that a thing will be in some time yet to come. As, the last day will come; I shall see an end.

The future time admits of two cases; either we may intend to express a thing that shall come to pass in a short time; or a thing that shall happen in any indefinite time. Thus the Greeks have their *paulo post futurum*, μετ' ὀλίγον μέλλων, which marks a thing just going to be done; as πεποιήσομαι; beside the common indefinite future, ποιήσω, *I will do it; scribam, I shall write.*

In Latin, Italian, French, and even in English, the future of the indicative expresses only the design or intention of doing a thing, or simply that the thing will be; as, I will praise, I will be approved: and the future of the subjunctive shews, that the thing will be done under certain circumstances; when I shall have seen Versailles, I will tell you. Sometimes the future is expressed in English by the present; if I meet your friend, I will send him to you; *si offendero, si incidero*, &c.

Mr. Harris, in his distribution of tenses, reckons three definite future tenses, besides the common indefinite future, which he calls the aorist of the future, *viz.* the inceptive future, as *scripturus ero, I shall be beginning to write;* the middle or extended future, as *scribens ero, I shall be writing;* and the completive future, as *scripsero, I shall have done writing.* See TENSE.

FUTWA, in *Geography*, a town of Hindoostan, in Bahar, at the union of the Little Pompon with the Ganges; 7 miles S.E. of Patna. N. lat. 25° 30'. E. long. 55° 28'.

FUUR LAND, an island of Denmark, in Lymfiord gulf; about 12 miles in circumference, of an irregular triangular form. It contains a town, called "Fuur," and two or three villages. N. lat. 56° 50'. E. long. 9° 2'.

FUZE, FUZEE, or *Fusee*, in the *Ordnance Department*, relates to the device in common use of supplying a bomb-shell, or grenade, with fire, so that, on arriving at its destination, the gunpowder contained within the cavity of the shell may be ignited, and cause that dreadful explosion, which in the aggregate is usually termed a "bombardment." To effect this purpose, a piece of tough wood is bored through for its whole length, and then exteriorly turned to such a diameter as may cause it, when driven nearly up to the neck, to stop the fuse-hole, made in every shell for the reception of the fuse, perfectly tight. This requires that the form of the fuse should be rather conical, and that the thicker end should be farther reinforced by such a swell, as should allow its interior to be hollowed out into the form of a cup; whereby a larger surface is exposed to the blaze occasioned by the discharge of the powder by which the shell receives its impulse from the mortar, howitzer, in which it was placed.

It being necessary that fuzes should not burn more than two or three seconds beyond that time for which their flight is calculated, great nicety is requisite in the preparation of the materials used in their composition, which are generally according to the following proportions.

Nitre	3 lbs.	4 oz.	or	13 parts.
Sulphur	1 lb.		—	4 parts.
Mealed powder	2 lbs.	12 oz.	—	11 parts.

These being severally pulverized with the greatest care, and sifted into a receiver, wherein they are mixed as they fall in, are blended perfectly, so that every part of the mass may be similarly composed. A small quantity is then poured into the wooden tube, which is placed in a very strong clasp-pillar made of brass, and secured by sliding rings, so as to prevent the wood from splitting when the man who has to "drive the composition," strikes the metal rod with much force; thereby occasioning the composition to occupy very little space, and to become extremely hard. In this manner, little by little, the tube is filled. It requires, however, great experience and judgment to fill every part of the tube with equal compactness, and to make any number of fuzes all of equal hardness, in order that their duration may correspond exactly according to their respective lengths. It is evident that such composition as is loosely rammed will burn out rapidly, while such as is rammed too hard, will burn so very slowly as to give time for the escape of those near whom a shell may fall; or even for their knocking the fuze out altogether.

The following table will shew the several proportions of fuzes, and their appropriate sizes to various classes of mortars, &c.; it will be seen that a well-made fuze should burn at the rate of one quarter of an inch for every second of time.

Nature of the mortar, &c.	Diameter of the fuze.			Composition.			Number of fuzes drove by one man in a day.
	Below the cup.	At the bottom.	At the cup.	Diameter.	Length.	Time it burns.	
Inches.	Inches.	Inches.	Inches	Inches	Inches	Seconds.	Number.
13	2.1	1.575	2.49	.5	8.4	35	25
10	1.8	1.35	2.13	.438	7.2	33	25
8	1.3	1.25	1.78	.375	6.37	29	30
$5\frac{1}{2}$	1.1	.825	1.3	.275	4.4	18	50
$4\frac{2}{5}$	1.0	.75	1.18	.25	3.5	15	700
Grenade	0 8	.6	.9	.2	2.25		1000

The diameter within the cup should be equal to three diameters of the bore; the depth of the cup should be $1\frac{1}{2}$ diameter of the bore; and the thickness of wood at the bottom of the bore should be equal to two diameters. Fuzes should be painted over entirely to preserve the composition; and,

and, when intended for field fervice, fhould be marked by narrow black lines, into feconds and half feconds, fo as to be promptly cut to any duration of flight.

FUZEE, in the *Manege*, two dangerous fplents, joining from above downwards: commonly a fuzee rifes to the knee and lames the horfe.

Fuzees differ from fcrews or thorough fplents in this, that the latter are placed on the two oppofite fides of the leg. See SPLENT.

FUZILEERS. See FUSILIERS.

FUZIR, in *Geography*, a town of Hungary; 12 miles S.S.E. of Cafchau.

FUZZEN, in *Rural Economy*, a provincial term fometimes employed to fignify the natural juice or nourifhment of a fubftance, or the ftrength of it. It is occafionally written *fuzen*.

FYEL. See FAYAL.

FYEN. See FUNEN.

FYERS. See FOYERS.

FYGAREERA, a town of Hindooftan, in the circar of Aurungabad; 10 miles S. of Jaffierabad.

FYKI. a town of Japan, in the ifland of Niphon; 40 miles N.E. of Jedo.

FYNIAL, the finifhing ornament of a pediment or canopy, or of a pinnacle, in the pointed order of *Architecture*. The term is now generally confined to the carved trefoil, or other ornament at the top of thofe members; but in the will of Henry VI. in which he provides for the building of his chapel at Cambridge, it is taken for the whole crocketted pinnacle which was fet upon each buttrefs.

FYOT, DE LA MARCHE, CLAUDE, in *Biography*, count de Bosjan, a French ecclefiaftic, was born at Dijon in the year 1630. He was educated among the Jefuits, and on occafion of one of their public days, Fyot was honoured by having Lewis XIV. among the number of his auditors, who was fo much pleafed with the performance, that in the year 1662 he nominated him abbot of the collegiate church of St. Stephen, at Dijon. The monarch alfo created him his almoner, and prior of Notre Dame, at Portarlier, on the Saone. He rofe to ftill higher honours in the church and ftate, and, at length, in 1668, the king gave him the rank of honorary counfellor of the parliament of Dijon; and, in the following year, a brevet of counfellor of ftate. He died at Dijon in 1721, at the great age of ninety-one. He eftablifhed and endowed a feminary for the education of young ecclefiaftics, and was himfelf a munificent benefactor to it. He publifhed, in 1696, "A Hiftory of the Abbey of St. Stephen," which is held in high eftimation on account of the profound and curious refearches which it contains relating to the antiquities of the city of Dijon. Befides this he was author of feveral pious and devotional treatifes. Moreri.

FYTHA-EL-BOTHNA, in *Geography*, a town of Africa, in the country of Sahara; fo called, as Dr. Shaw fuppofes, from the number of turpentine trees which grow there; 34 miles S.W. of Bocferjoone.

FYTT, JOHN, in *Biography*, an eminent painter of animals, fruit, and flowers, born at Antwerp in 1625. He was an artift of very uncommon powers; who, having paid the clofeft attention to the productions of nature, imitated them with great fpirit, truth, and accuracy. His colour is very rich and agreeable, his touch firm and animated; he generally worked with a full body of colour, and great readinefs and freedom of hand is exhibited in his works, which render them eafily cognizable.

His choice of fubjects was among the brute and the vegetable creation, whofe character he rendered with great fidelity; defcribing fometimes in his more laborious works the hairs and plumage of his beafts and birds. He frequently painted pictures conjointly with Rubens and Jordaens, and completely unites with their extraordinary effects his own peculiar labours.

FYVIE, in *Geography*, a town of Scotland, in the county of Aberdeen, near the Ythan, in the road from Aberdeen to Bamff; 25 miles N. of Aberdeen.

FYZABAD, a town of Hindooftan, and till of late the capital of Oude, feated on the river Gogra, a very large river from Thibet, and about eighty miles E. of Lucknow, and 360 from Calcutta. It is a very large city, and though for many years the capital of the nabobs of Oude, inconveniently fituated, even before the Rohilla conqueft. Nearly adjoining to it is the very ancient city of Oude or Ajudiah. This place was founded by Sadatkhan, a Perfian, who was 40 years governor of the province. He firft built a palace, to which he annexed extenfive gardens, and made this the place of his refidence; he then added many houfes, till it became a large city, and the capital of the province; it was defended with a fortrefs, a ditch, tower, ramparts, &c. N. lat. 26° 45′. E. long. 82 24′.

G.

G, The feventh letter of our alphabet, and the fifth confonant; though in the alphabets of all the oriental languages, the Hebrew, Phœnician, Chaldee, Syriac, Samaritan, Arabic, and even Greek, G is the third letter.

The Hebrews call it *ghimel*, or *gimel*, q. d. *camel*; becaufe it refembles in its form the neck of that animal; and the fame appellation it bears in the Samaritan, Phœnician, and Chaldee: in the Syriac it is called *gomel*, in Arabic *gim*, and in Greek *gamma*.

The letter G is of the mute kind, and cannot be any way founded without the help of a vowel. It is formed by the reflection of the air againft the palate, made by the tongue, as the air paffes out of the throat; which Martianus Capella expreffes thus, G fpiritus cum palato; fo that the G is a palatal letter.

G in Englifh has two founds, one from the Greek Γ, and the Latin, which is called that of the hard G, becaufe it is formed by a preffure, fomewhat hard, of the fore-part of the tongue againft the upper gum; which found it retains before *a, o, u, l, r*; as *gate, go, gull*. At the end of a word it is always hard, as *ring, fing*, &c. The other found, called that of the foft G, refembles that of *j*, and is commonly, though not always, found before *e* and *i*, as in *gem* and *gibbet*. To this rule, however, there are many exceptions; G is often hard before *i*, as *give*, &c. and fometimes before *e*, as *get*, &c. It is alfo hard in derivatives from words ending in *g*, as *finging, ftronger*, &c. and generally before *er*, at the end of words, as *finger*. G is mute before *n*, as *gnafh, fign*. *Gh* has the found of the hard G in the beginning of a word, as *ghoftly*; in the middle, and fometimes at the end, it is quite filent, as *right, though*. At the end of a word *Gh* has often the found of *f*, as *laugh*. Johnfon.

The Latins took the liberty to drop the letter G at the beginning of words, before an *n*; as in *gnatus, gnofco, gnobilis, gnarrat*, &c. which they ordinarily wrote *natus, nofco, nobilis*, &c. They alfo frequently changed it into *c*; as *gamelus*, into *camelus*; *gragulus, graculus*; *quingentum, quincentum*, &c. Sometimes it was put inftead of *n*, before a *c*, and for another *c*; as *Agchifes, aggora, agguilla*, &c. for *Anchifes, ancora, anguilla*, &c. And inftead of *p*; as *magalia*, for *mapalia*, &c. G is alfo ufed inftead of *q*, and *q* inftead of G, as in *anquina, angina, anguina*, &c. inftead of *r*, as in *aquagium*, for *aquarium*; *agger*, for *arger*, &c. And inftead of *s*, as in *fpargo, fparfi, fparfum*; or rather it is retrenched from thofe laft words to avoid the cacophony of *fpargfi*, or *fparcfi*. G is alfo put for *c*; as in *Cneius*, for *Gneius*; *Caius*, for *Gaius*; *Caeta*, for *Caieta*; and for *v*; as in *figere*, for *fivere*. See N, P, &c.

The northern people frequently change the G into *v*, or *w*; as in *Gallus, Wallus*; *Gallia, Wallia, Vallia*, &c. For in this inftance it muft not be faid that the French have changed the *w* into G; becaufe they wrote *Gallus* long before *Wallus*, or *Wallia*, were known; as appears from all the ancient Roman and Greek writers.

And yet it is equally true, that the French change the *w* of the northern nations, and *v* confonant, into G; as *Willielmus, William*, into *Guillaume*; *Wulphilas*, into *Gulphilas*; *Vafco*, into *Gafcon*, &c.

Diomed, lib. ii. cap. de Litera, calls G a new letter; his reafon is, that the Romans had not introduced it before the firft Punic war; as appears from the roftral column, erected by C. Duilius, on which we every where find a *c* in lieu of G. It was Sp. Carvilius who firft diftinguifhed between thofe two letters, and invented the figure of the G; as we are affured by Terentius Scaurus. The *c* ferved very well for G; it being the third letter of the Latin alphabet, as the G or γ was of the Greek.

The G is found inftead of *c* on feveral medals: Vaillant, Num. Imperat. tom. i. p. 39. M. Beger produces a medal of the Familia Ogulnia, where GAR is read inftead of CAR, which is on thofe of M. Patin. But the *c* is more frequently feen on medals in lieu of G; as AUCUSTALIS, CALLAECIA, CARTACINENSIS, &c. for AUGUSTALIS, &c. Not that the pronunciation of thofe words was altered, but only that the G was unartfully or negligently cut by the workmen; as is the cafe in divers infcriptions of the Eaftern empire; where AUC, AUCC, AUCCC, are frequently found for AUG, &c.

The form of our G is taken from that of the Latins, who borrowed it from the Greeks; the Latin G being certainly a corruption of the Greek gamma, Γ, as might eafily be fhewn, had our printers all the characters and forms of this letter which we meet with in the Greek and Latin MSS. through which the letter paffed from Γ to G.

As to the gamma of the Greeks, it is manifeftly the ג of the Hebrews or Samaritans. All the difference between the gamma and ghimel confifts in this, that the one is turned to the right, and the other to the left, according to the different manners of writing and reading, which obtained among thofe different nations; fo that all the pains Salmafius has taken on Solinus, to prove that the G was derived from the Greek kappa, is loft.

G, as a Roman abbreviature, has various fignifications. It denotes *gratis, gens, gaudium*, &c. G. V. fignifies *genio urbis*, and G. P. R. *gloria populi Romani*.

G has alfo been ufed as a numeral letter, fignifying 400, according to the verfe,

"G quadringentos demonftrativa tenebit."

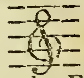
When a dafh was added at the top, $\bar{G}$, it fignified forty thoufand.

G, in *Chronology*, is the feventh dominical letter.

G, on the French *Coins*, denotes the city of Poitiers.

G, in *Mufic*, is the loweft found of the fcale of Guido, in which it is called *Gammut*; which fee. The octave above

4 gammut,

gammut, in the fame fcale, is called *ut*, or G *fol-re-ut*. It is called *ut*, or *do*, as the firft note of the *durum hexachord*. (See Hexachord.) It is called *fol*, as 5th of the natural hexachord of C; and *re*, as the 2d of the molle hexachord of F. G gives a name to the clef in which almoft all treble parts are written for inftruments; as the violin, flute, clarinet, and hautbois: it is called by the Italians *chiave di violino*, and is placed on the fecond line thus: 

During the 17th century, and part of the laft, the French placed this clef on the firft line, and ufed no other treble clef; whence it was called the French clef. Geminiani, in his firft book of folos, has ufed it, to fave leger lines, in very high paffages.

The key of G, with a minor or flat third, is called by the Italians G molle.

GA-BOAT, in *Engineery*, is the name of a fort of veffels which navigate the Clyde river.

GAANA, in *Ancient Geography*, a town of Afia, in Coelefyria. Ptolemy.

GAARDE, in *Geography*, a town of Norway, in the diocefe of Aggerhuus; 56 miles N.W. of Chriftiania.

GABA, in *Ancient Geography*, a town of Paleftine, in the tribe of Benjamin. Jofh. xviii. 24.—Alfo, a town of Judea, in the tribe of Zabulon; fituated, according to Jofephus, at the foot of mount Carmel, between Ptolemais and Cæfarea.

GABADANIA, a country of Afia, in Cappadocia, fituated at the foot of mount Taurus, and adapted merely to pafture.

GABAE, a country of Afia, fituated between the Maffagetæ and Sogdiana. Arrian.

GABALA, a town of Phœnicia, fituated 18 miles from Laodicea, on the fea-coaft, at the foot of mount Cafius.—Alfo, an epifcopal town of Afia, in Lydia.

Gabala, in *Geography*, a town of Arabia Felix; 64 miles N.N.E. of Aden.

GABALÆCA, in *Ancient Geography*, a town of Hifpania Tarragonenfis, at fome diftance from the fea, in the country of the Varduli. Ptolemy.

GABALE, a Mediterranean town of Media. Ptol.

Gabale, in *Mythology*, a deity worfhipped at Heliopolis, under the figure of a lion, with a radiant head; and it is thus reprefented on many medals of Caracallus.

GABALI, or Gaballi, in *Ancient Geography*, a people of Gaul, who belonged to Aquitania Prima.

GABARA, one of the three principal towns of Galilee; the other two were Sephoris and Tiberias.

GABARDINE, from the Italian *gavardina*, has been fometimes ufed to denote a coarfe frock, or mean drefs. In this fenfe it is ufed by Shakfpeare in his Tempeft and Merchant of Venice, and by Butler in his Hudibras, book i.

GABARON, in *Geography*, a bay on the S.W. of Louifburg, on the ifland of cape Breton.

GABARRET, a town of France, in the department of the Landes, and chief place of a canton, in the diftrict of Mont-de-Marfan, feated on the Gelife; 24 miles E. of Mont-de-Marfan. The place contains 605, and the canton 7882 inhabitants, on a territory of 480 kiliometres, in 19 communes.

GABASALKI, a town of Ruffia, in the government of Viborg, or Wiburgh; 36 miles N. of Serdopol.

GABBARA, a name which the Egyptians gave the dead bodies which they kept by them, inftead of burying them.

That people, out of a cuftom which they had received from their anceftors, and which arofe, in fome meafure, from the pofition of their country, which is expofed to the inundations of the Nile, ufed to wrap up the bodies of perfons of eminence, particularly thofe of faints and martyrs, in a great number of linen cloths, with balms and fpices; and inftead of interring them, they preferved them in their houfes: thinking that thereby they did them much more honour. (See Embalming, and Mummy.) And thefe, St. Auguftine tells us, were what they called gabbaras. Sermon cxx. de diverfis, cap. 12.

Pliny makes mention of the fame thing, lib. vii. cap. 16. where he relates, that in the time of Claudius, a gabbara was brought from Arabia, almoft ten feet long.

The word is Arabic, Syriac, and Hebrew, formed of גבר, *gaber*, *a man*, and denotes an embalmed body.

GABBIANI, Antonio Dominico, in *Biography*, a painter of hiftory and portraits, born at Florence in 1652. He began his career under the tuition of Soutermans, and Vincenzio Dandini, and acquired all the freedom of execution and defign, together with the weaknefs and defects of ftyle which thofe mafters exhibited in their works. He was highly patronized and encouraged by the grand duke Cofmo III., who fent him to Rome, to ftudy in the Florentine academy there, under the direction of Ciro Ferri. He excelled moft in fubjects of a light and agreeable nature; yet he had a large fhare of more ferious employment, and painted many altar-pieces. They are not in a ftyle fuited to their importance, when compared to the fine works of a better period. His moft famed work is the cupola of Coftello, which was never completed, as he fell from a fcaffold, and was killed during the time he was working upon it in 1726.

GABBRONITE, in *Mineralogy*, a new mineral fubftance, firft difcovered in Norway, and defcribed by profeffor Schumacher of Copenhagen, who applied the above name to it, derived from its refemblance in point of colour and fracture to fome varieties of the ferpentine rocks, called *gabbro* by the Italians.

Its colour is blueifh or greenifh-grey, rather tending to leek-green, and alfo greyifh mountain green. It has been found maffive and diffeminated. Luftre faintly glimmering, or dull; not greafy to the touch. Fracture clofe, even, or flat conchoidal, fometimes fplintery, in the manner of hornftone. Fragments indeterminately angular, with pretty fharp and ftrongly tranflucent edges.

It gives no fparks with fteel, and though it fcratches glafs, is likewife fcratched by this latter, and by the knife. It is not eafily frangible: when triturated it yields a white powder. Specific gravity 2.947.

Before the blow-pipe it immediately lofes its colour and becomes white: and farther urged by the heat of the flame, it fufes without ebullition into a white opaque or faintly tranflucent pearl. With borax it yields a clear but rather veficular pearl.

The blueifh-grey variety, which is found in the Kenlig mine at Arendal in Norway, is accompanied by black, maffive, fine-grained, common hornblende, and reddifh-grey fcaly lime-ftone. That of greyifh mountain green colour occurs at Friedrickfvärn in Norway, diffeminated in a rock compofed of common hornblende, common and labrador feldfpath. It is alfo accompanied by fpecular iron and talc.

This fubftance, not being analyfed, its nature is not yet exactly known. Some mineralogifts fufpect it to be nearly allied to that kind of meagre nephrite, called *feldfpath tenace* by Haüy.

GABBULA, in *Ancient Geography*, a town of Afia,

in Syria, ſituated N.E. of a Salt-lake, E. of Chalcis, and S.E. of Chalybon.

GABE, a town of Syria, called by Joſephus Gaba, and by Pliny Gabba. The latter of whom intimates that it was one of the tetrarchies, which adjoined to the towns of the Decapolis.—Alſo, a ſmall town of Paleſtine, 16 miles from Cæſarea; probably the ſame with the preceding.

GABEL, or GABELLE, in the *French Cuſtoms*, a duty or impoſition on ſalt.

Etymologiſts are divided as to the origin of the word. Some derive it from the Hebrew *gab*, a *preſent*; others from הבל, *to deliver*; others from קבלה, *kabbalah*, *receipt*; others from *ghauel*, or *gabe*, *unjuſt law*; and others from the corrupt Latin *gabella*, or *gablum*, *tribute*.

The gabel is let out to farm; and formed, before the revolution in France, the ſecond article in the king's revenue.

There were three farms of gabels: the firſt comprehended the greateſt part of the kingdom; the ſecond was that of the Lyonnois and Languedoc; and the third that of Dauphiné and Provence. There were ſeveral provinces exempt from the gabel, having purchaſed that privilege of Henry II.

This duty is ſaid to have had its riſe in France, in 1286, under Philip the Fair. Philip the Long took a double per livre on ſalt, by an edict in 1318, which he promiſed to remit when he was delivered from his enemies; which was renewed by Philip de Valois in 1345; and the duty was raiſed to four deniers per livre; king John reſumed it in 1355, and it was granted to the Dauphin in 1358, to ranſom king John. It was continued by Charles V. in 1366; after his deceaſe it was ſuppreſſed, but revived again by Charles VI. in 1381. Louis XI. raiſed it to twelve deniers per livre; and Francis I. in 1542, to twenty-four livres per muid; and it has been conſiderably augmented ſince that time; ſo that a minot of ſalt paid a duty of 52 livres, 8 ſols, and 6 den. Philip de Valois firſt eſtabliſhed granaries and officers to the gabelles, and prohibited any other perſons from ſelling ſalt; from which time the whole commerce of ſalt, for the inland conſumption, lay wholly in the king's hands, who ſold and diſtributed every grain thereof by his farmers, and officers created for the purpoſe.

The produce of this impoſt was ſo conſiderable, that it was computed to make one fourth of the whole revenue of the kingdom.

GABEL, or *Gable*, is alſo uſed, in ſome of our *Ancient Writers*, for any ſort of tax, or impoſition: as gabel of wines, of ſilks, &c.

GABEL, or *Gablona*, in *Geography*, a town of Bohemia, in the circle of Boleſlaw; 45 miles N. of Prague. N. lat. 50° 44′. E. long. 14° 54′.

GABELLUS, in *Ancient Geography*, *La Secchia*, a river which commenced on the confines of Apuani, in Liguria, and diſcharged itſelf into the Padus.

GABENA, a town of Aſia, in Media. Ptol.

GABERSTORF, in *Geography*, a town of Stiria; 10 miles W.S.W. of Gnaa.

GABIANA, in *Ancient Geography*, a province of Aſia, near Suſiana, which belonged to the Elymæans, according to Strabo.

GABIÆI, a town of Italy, in Latium; nearly E. of Rome.

GABIN, in *Geography*, a town of the duchy of Warſaw; 40 miles W. of Warſaw.

GABINDA, or KAPINDA, a town of Africa, in the kingdom of Loango.

GABINIA TOGA. See TOGA.

GABINIAN LAW, in *Roman Antiquity*, a law, ſo called from Gabinius, tribune of the people, who, at the inſtigation of Pompey, propoſed it for clearing the ſeas of the pirates, whoſe number and power were daily increaſing. Theſe robbers fitted out at firſt but a ſmall number of light veſſels; but upon their being protected by Mithridates, who, during his war with Rome, took them into his ſervice, they equipped 1000 gallies, and exerciſed a kind of ſovereignty over all the coaſts of the Mediterranean. They ſpared not one temple that was famous for its riches on the coaſts of Italy, Greece, and Aſia. All the country-ſeats on the ſea-ſhore fell a prey to them. They took ſlaves without number; blocked up all the ports of the republic, pillaged the city of Caieta; ſunk part of a conſular fleet at Oſtia; and having made a deſcent near Miſene, carried away the daughter of the old conſul Antonius, with ſeveral other perſons of diſtinction. They committed a variety of other depredations; and therefore Gabinius, who propoſed the above-mentioned law, was applauded for his zeal; though he had nothing in view but to procure new honours for Pompey, who had reſtored the college of tribunes to their former authority. In virtue of this law the perſon to whom the Roman people and ſenate ſhould commit the management of this war was to have a power without reſtriction, his authority was to extend over the ſeas within the ſtraits, or the pillars of Hercules, and over the countries for the ſpace of 400 furlongs from the ſea. He was alſo impowered by this law to raiſe as many mariners and ſoldiers as he ſhould think fit, to take any ſums at pleaſure out of the treaſury, and to chooſe out of the ſenate fifteen ſenators to be his lieutenants This arbitrary and unbounded authority was to continue three years, and of courſe it occaſioned much uneaſineſs to the ſenate, who ſaw through the tribune's deſign, and ſeveral ſenators reproached Pompey with aiming at the ſovereignty of Rome. After much oppoſition, Gabinius's motion was agreed to by a great majority, and Pompey was appointed to make war upon the pirates with the title of proconſul, B. C. 66. A. U. C. 682. Pompey, in virtue of this law, was furniſhed with 500 ſhips, 120,000 foot, and 5000 horſe; and he conducted the expedition with ſo much prudence and vigour, that he cleared the ſea in four months, after having taken or ſunk 1300 according to ſome, or according to others, 846 of their veſſels, deſtroyed 10,000 of the pirates, and reduced 120 towns or caſtles on the coaſts, which they had ſeized. In this expedition the proconſul ſet at liberty an incredible number of captives, and took above 20,000 priſoners, whom he ſent to people the deſerted cities of Cilicia, *viz.* Mallus, Adena, Epiphania, and Soli, which latter he called from his own name Pompeiopolis.

GABINIUS, AULUS, in *Biography*, an ancient Roman commander, who began his public career under the dictator Sylla about the year B. C. 82. He arrived at the high honour of the conſulate in 58, and in the following year obtained the government of the rich province of Syria. Here he carried on his oppreſſions with a heavy hand; made war againſt Alexander in Judea, whom he quickly reduced to ſue for peace; re-eſtabliſhed Hyrcan in the dignity of pontiff, and ſet the government of that country upon a new ſyſtem. He then undertook, for a large ſum, to replace Mithridates on the throne of Parthia, whoſe intereſts he readily abandoned when a ſtill larger bribe was offered him by Ptolemy Auletes, king of Egypt, to aſſiſt in re-eſtabliſhing him on his throne, which had been uſurped by his ſon-in-law Archelaus. Gabinius, for the ſtipulated ſum of ten thouſand talents, half of which was paid when the agreement was made, proceeded with his army into Egypt, though it was contrary to an expreſs law for a governor to march out

of

of his province, or engage in a new war without the confent of the fenate. He fecured the paffes by the horfe under Marc Antony, and following immediately into the heart of the country, gave Archelaus a total defeat, and took him prifoner, but for another bribe he fuffered him to efcape. The ambition of Archelaus induced him again to take up arms, till at length he was flain, and Ptolemy was quietly feated on his throne. Gabinius was accufed at Rome of high crimes and mifdemeanors, and Cicero was employed to conduct the profecution. Such was the indignation excited againft him, that he would have been condemned in his abfence, had he not been fupported by the confuls Pompey and Craffus. In the year 54 he was impeached of high treafon, and acquitted by a fmall majority: he was next tried upon two actions for corruption and extortion, and though now defended by Cicero, he was fentenced to perpetual banifhment. He was obliged to expend his ill-gotten wealth in bribes to his judges, and lived abroad in poverty and obfcurity, till the breaking out of the civil war between Cæfar and Pompey. Under the former he acted in the capacity of lieutenant, and marching through Illyricum, he was defeated with great lofs by the people of the province, and compelled to take refuge in Salona. He did not long furvive this difafter. Rom. Hift.

GABIONS, in *Fortification*, &c. are large cylindric bafkets, open at both ends, made of ozier twigs, about three feet high, and as much in diameter; having nine or ten ftakes, about an inch and a half in diameter, which exceed the bafket-work above five or fix inches, and are pointed. Thefe ferve in fieges to carry on the approaches under cover, when they come pretty near the fortification.

They are commonly ufed in batteries to fcreen the engineers, &c. in order to which one is placed on either fide each gun, only leaving room for the muzzle to appear through.

There is alfo a fmaller fort of gabions, about one foot high, twelve inches in diameter at the top, and from eight to ten at bottom, ufed on parapets, in trenches, &c. to cover the mufketeers; being placed fo clofe as that a mufket can but juft peep through.

They alfo ferve as a parapet on lines, lodgments, &c. where the ground proves too hard to dig into.

Gabions, *Stuffed*, are five or fix feet long, and as much in diameter, filled with branches and fmall wood, and ferving to roll before the workmen in trenches, and to cover them in front againft mufket-fhot. See Mantlet.

To render the gabions ufelefs, they endeavour to fet them on fire, by throwing pitched faggots among them.

GABISE, in *Geography*, a town of Afiatic Turkey, in Natolia; 28 miles S.E. of Conftantinople.

GABLE, in *Architecture*, is a vertical triangular plane wall, generally furmounting the flank walls, and terminating an end of the roof, which either covers the gable, or the coping of the gable runs parallel to the plane of the roof, and covers the ends of the flating or covering. The difference between a gable and pediment is this; a gable has no cornice, but a pediment is furrounded with cornices, one of which is horizontal, and the other two equally inclined to it. See Pediment.

Gable *Land*. See Land-*gable*.

Gable *End Foreland*, in *Geography*, a cape on the E. coaft of the northern ifland of New Zealand, in the South Pacific ocean. S. lat. 38° 15'.

GABLENZ, a town of Saxony, in the circle of Erzgeburg; 6 miles N.N.W. of Zwickau.

GABLOCK, in *Mining*, is a large iron crow or bar, ufed for raifing large ftones in a mine or quarry.

Gablocks, the artificial fpurs of a game-cock.

GABON, in *Geography*, a river of Africa, which runs into the Atlantic, near Cape St. Clara, and gives name to a country through which it paffes.

GABOONG, a fmall ifland in the Eaft Indian fea, near the S.W. coaft of the ifland of Palawan. N. lat. 8° 9'. E. long. 117° 20'.

GABORI, a bay on the S.E. coaft of Cape Breton ifland; its entrance is not more than 20 leagues from the ifles of St. Pierre, and lies between iflands and rocks, about a league in breadth. The bay, which is two leagues deep, affords good anchorage.

GABOU, or Jabou, a country of Africa, between Benin and Dahomy, about 150 miles from the coaft; the chief trade confifts in flaves.

GABRANTUICI, *Bay of*, in *Ancient Geography*, is Burlington bay, on the coaft of Yorkfhire. Ptolemy.

GABRES, or Gavres, a religious fect in Perfia and India; called alfo *Gebres*, *Gevres*, &c. See Magi.

The Turks call the Chriftians Gabres, q. d. infidels, or people of a falfe religion; or rather, as Leunclavius obferves, Heathens, or Gentiles: the word Gabre, among the Turks, having the fame fignification as Pagan, or Infidel, among the Chriftians; and denoting any thing not Mahometan.

In Perfia the word has a more peculiar fignification; wherein it is applied to a fect difperfed through the country, and faid to be the remains of the ancient Perfians, or followers of Zoroafter, being worfhippers of fire. See Fire, *everlafting*.

They entertain the moft profound veneration for this ancient philofopher, whom they confider as the great prophet fent by God to communicate his law, and to inftruct them in his will.

They have a fuburb at Ifpahan, which is called Gaurabad, or the town of the Gaurs, where they are employed in the meaneft and vileft drudgery: fome of them are difperfed through other parts of Perfia; but they principally abound in Kerman, the moft barren province in the whole country, where the Mahometans allow them liberty, and the exercife of their religion. Several of them fled many ages ago into India, and fettled about Surat, where their pofterity remain to this day. There is alfo a colony of them at Bombay. They are a poor, ignorant, inoffenfive people, extremely fuperftitious, and zealous for their rites, rigorous in their morals, and honeft in their dealings. They profefs to believe a refurrection and a future judgment, and to worfhip only one God. And though they perform their worfhip before fire, and direct their devotion towards the rifing fun, for which they have an extraordinary veneration, yet they ftrenuoufly maintain that they worfhip neither, but that thefe are the moft expreffive fymbols of the Deity; and for this reafon they turn towards them in their devotional fervices. See Thevenot's and Tavernier's Voyages, and Hyde's Rel. Vet. Perf. cap. xxiv.

However, fome have fuppofed that thefe are Perfians converted to Chriftianity, who, being afterwards left to themfelves, mingled their ancient fuperftitions with the truths and practices of Chriftianity, and fo formed for themfelves a religion apart: and they allege that, throughout the whole of their fyftem of doctrine and practice, we may difcern the marks and traces of Chriftianity, though grievoufly defaced; the annunciation, the magi, the maffacre of the infants, our Saviour's miracles, his perfecutions, afcenfion, &c.

GABRI, in *Ancient Geography*, a people of Sarmatia, near the Palus-Mæotides. Pliny.

GABRIEL,

GABRIEL, St. in *Geography*, an island in the great river La Plata, S. America, discovered by Sebastian Cabot in the year 1526.

Gabriel, *St.* a Spanish mission and settlement in New Albion, first formed in 1773; 12 miles N. E. of Point Lasuen.—Also, a town of Mexico, in New Biscay; 170 miles S. S. W. of Parral.

GABRIELI, Andrea, in *Biography*, an eminent performer on the organ, maestro di cappella of St. Mark's cathedral at Venice in the 16th century, and a voluminous composer. In 1589, he published "Ricercari a quattro," the precursors of *Fantasie*, which see. Padre Martini, in the first vol. of his "Storia della Musica," gives the following list of his vocal compositions; Missar. 6. voc. lib. i. Ven. 1570. Trelibridi Madrig. a 3. 6. voci. Ven. 1580, 1582, 1583. Motteƈta 5. voc. lib. i. Venet. 1584. Psalmi Penitent. 6. voci. Venet, 1583. Canzoni alla Franzese per l'Organo, Ven. 1605.

GABRIELITES, in *Ecclesiastical History*, a sect of anabaptists that appeared in Pomerania in 1530. They derive their name from Gabriel Scherling, who, after having been for some time tolerated in that country, was obliged to remove, and died in Poland.

GABRIELLI, Giovanni, in *Biography*, engaged in the service of the republic of Venice, published, in 1587, Concerti Music di Chiesa, e Madrigali a 6, 7, 8, 10. 12. 16. voci. lib. i and ii. Intonationi d'Organo, lib. i. Ven. 1593.

Gabrielli, Catterina. Nothing having happened since the 4th vol. of the Gen. Hist. of Mus. was published to change our opinion of the talents of this female singer, we shall extract the article from that work.

The most memorable musical event of the season of 1775 and 1776, was the arrival in London of the celebrated Catterina Gabrielli, called early in life La Cuochetinæ, being the daughter of a cardinal's cook at Rome. She had, however, no indications of low birth in her countenance or deportment, which had all the grace and dignity of a Roman matron. The first time her name appears in the "Indice de' Spettaecoli Teatrali," ten years before she came to England, when she sung at Turin; to her name is added, *bravissima*, and her reputation was so great before her arrival for singing and caprice, that the public, expecting perhaps too much of both, was unwilling to allow her due praise in her performance, and too liberal in ascribing every thing she said and did to pride and insolence. It having been reported that she often feigned sickness, and sung ill when she was able to sing well, few were willing to allow she could be sick, or that she ever sung her best while she was here; and those who were inclined to believe, that sometimes she might perhaps have exerted herself, in pure caprice, thought her voice on the decline, or that fame, as usual, had deviated from truth in speaking of her talents. Her voice, though of an exquisite quality, was not very powerful; and her chief excellence having been the rapidity and neatness of her execution, the surprize of the public must have been diminished on hearing her after Miss Davies, who sung in the same style many of her songs, with a neatness so nearly equal, that common hearers could distinguish no difference. There were, however, a few fair and discriminating critics, who discovered a superior sweetness in the natural tone of the Gabrielli's voice; an elegance in the finishing her musical periods or passages; and an accent and precision in her divisions, not only superior to Miss Davies, but to every singer of her time. As an actress, though of low stature, there were such grace and dignity in her gestures and deportment, as caught every unprejudiced eye; indeed, she filled the stage and occupied the attention of the spectators so much, that they could look at nothing else while she was in view. Her freaks and *espiegleries*, which had fixed her character, seem to have been very much subdued before her arrival in England. In conversation she seemed the most intelligent and best bred virtuosa with whom we had ever conversed; not only on the subject of music, but on every subject concerning which a well educated female, who had seen the world, might reasonably be expected to have obtained information. She had been three years in Russia previous to her arrival in England, during which time no peculiarities of individual characters, national manners, or court etiquette, had escaped her observation. In youth, her beauty and caprice had occasioned a universal delirium among her young countrymen, and there were still remains of both sufficiently powerful, while she was in England, to render credible their former influence. With respect to the rapidity of her execution, it was never so excessive as to cease to be agreeable; in slow movements her pathetic powers, like those in general of performers the most renowned for agility, were not sufficiently touching or effectual to occasion disputes concerning her *genre*. Soon after she quitted England, she retired to Bologna, where, if still living, we hope she resides in private tranquillity, after all the storms which her beauty and talents had occasioned, while she remained in the service of the public.

GABRIEL-SIONITA, a learned Maronite who flourished in the seventeenth century, was professor of the Syriac and Arabic languages at Rome. From this city he went to Paris, to take a part in editing the Polyglot bible, published by M. Le Jay, and carried with him some Syriac and Arabic versions transcribed by himself from MSS. The Latin translations which accompany these versions, excepting those of the book of Ruth, were furnished by Sionita. After this he was appointed professor royal of the Syriac and Arabic languages at Paris, and was highly esteemed and much employed as a tutor in them. He died in the year 1648. Walton, in the English Polyglot, has copied the versions introduced into Le Jay's by Sionita. This learned man published translations of other Arabic works, and among these was an Arabic geography, entitled "Geographia Nubiensis." Moreri.

GABRINI, Nicholas, better known under the name of Rienzi, an extraordinary political character, was born in the fourteenth century at Rome. His father was a tavern keeper of the lower order, and named Lorenzo, which being contracted to Rienzo, the son was called Nicolo or Cola di Rienzo. He received an excellent education, the advantages of which he knew well how to estimate. He was never satiated with reading the best Roman authors, nor with searching into the reliques of antiquity dispersed through his native city. He soon became celebrated, and the common people, who do not readily give all the credit due to a literary character, were accustomed to regard him as an extraordinary person, and to look up to him as one destined to redress those wrongs of which they were deeply sensible; and the higher orders of the citizens viewed him with respect, on account of his acknowledged learning and talents. His first post was that of a public scribe or notary, and, in 1346, we find him joined in a deputation from the Romans to the new-elected pope Clement VI. at Avignon, for the purpose of exhorting him to bring back the papal court to its original seat. He spoke on this occasion with so much force and real eloquence, and painted in such strong colours the insolences and oppressions of the nobles, that high ideas were excited of his character; the pope created him an apostolic notary,

notary, but gave no explicit reply to the deputies. Upon his return he entered upon the exercife of his office, which he difcharged with diligence and great probity, but at the fame time he was attentive to foment the difcontents of the people by harangues againft the nobility, and againft the abufes in the public adminiftration. When men's minds were prepared for a change, he fummoned his friends, and having made an energetic fpeech, defcribing the wretchednefs and degradation into which the Chriftian capital was fallen, and from which nothing but the efforts of its own citizens could raife it, he caufed them to fubfcribe an oath for the eftablifhment of the "Good Eftate." He had the addrefs to gain over the pope's vicar; and at a fecond meeting in the capitol, he produced fifteen articles as the bafis of the "Good Eftate," which were unanimoufly approved, and the people conferred upon him the title of tribune, with the power of life and death, and all the other attributes of fovereignty. The governor of the city, Colonna, who had been abfent fome time, returned, and at firft threatened him with punifhment, but quickly found that the power of the ftate was taken out of his hands, and that he himfelf muft feek for fecurity by flight. Rienzi banifhed him with the principal noble families of Rome, and fome, who had been convicted of great oppreffion, were put to death. In the firft exercife of his authority he feems to have had no other view than the promotion of the public good; he chofe honeft and honourable men at the head of the adminiftration, and he purged Rome of thofe enormities that had long prevailed in it. His power was fanctioned by the pope, and his reputation was foon extended through the whole of Italy; the meffengers whom he fent to propofe to the different ftates a general league, were every where received with high refpect, though unarmed, and only diftinguifhed by a filver wand, and honourable embaffies were fent to him in return. The king of Hungary and the emperor folicited his friendfhip, and it was imagined, by his more eager partizans, that he was to be an inftrument in the hands of providence, for reftoring the ancient grandeur of Rome and Italy. Among the moft eager of his friends was the celebrated Petrarch, who had contracted an admiration for his character, when joined with him as one of the deputies to the pope; by the poet he was exhorted to proceed in his glorious undertaking, but his fuccefs was more than he could bear. He affumed a variety of titles, iffued a letter declaring Rome the head of the world, and he even ventured to cite the two rival emperors, Charles and Lewis, and the electors, to appear before him, and juftify their feveral pretenfions. He difmiffed the pope's legate, reduced the nobles to a ftate of humiliation, and eftablifhed a reign of terror. He now found, that thofe who had been moft friendly to his caufe, while he acted with prudence and moderation, were the firft to defert his ftandard, when that ftandard was attempted to be reared on the rights of the people. Finding that he had loft the affection and confidence of the people, he withdrew from Rome, and, in the beginning of the year 1348, took refuge in the kingdom of Naples, and was obliged to live concealed in a hermit's cell till the commencement of 1350. He now took advantage of the jubilee to return fecretly to Rome, where being difcovered, he withdrew to the king of the Romans at Prague. After this he fell into the hands of pope Clement at Avignon, who threw him into prifon, and appointed a commiffion of three cardinals to try him; but upon the death of that pope, his fucceffor, Innocent VI. releafed him from confinement, and fent him to Rome, in order to oppofe an infurgent who had feized the government of that capital. The Romans received him again with great demonftrations of joy, and he even recovered his former authority, which, however, he held but a fhort time, when the nobles found means to excite a fedition againft him, in which he was maffacred, in October 1354. His dead body was treated with the greateft indignity by the people; and "his end," obferves the biographer, "adds one more example, to the many recorded by hiftory, of the ufual fate of popular leaders and reformers." He poffeffed an union of fanaticifm with artifice; and was more courageous in fpeech and council than in action. His original intention was unqueftionably good, but neither his temper nor underftanding was adequate to the greatnefs of his enterprize. He wanted prefence of mind in emergencies of danger, and he is faid to have betrayed a fhameful timidity in the laft fcene of his life.

GABRIS, in *Ancient Geography*, the name of two towns in the interior of Media. Ptolemy.—Alfo, a place in Gaul, which lay, according to the tables of Peutinger, in the route from Cæfarodunum to Avienum. M. d'Anville refers it to Chabris, N. W. of Bourges.

GABRITA, or GABRETA, a foreft, between which and the mountains of the Sarmatians lay the Hercynian foreft, which fee.

GABRITA, *Sylva*, a foreft which lay on the S. W. of Bohemia, where a chain of hills now divides it from Bavaria.

GABS, a town of Africa, in the S. E. part of Tunis, in a bay of the Mediterranean, called the Leffer Syrtis, anciently called "Tacape," and by Scylax "Epichus," of which ancient city a heap of ruins ftill remains, with fome beautiful granite pillars, fquare, and about 12 feet in length. The old city, where thefe ruins are found, was built upon a rifing ground, at half a mile's diftance from the new, having been formerly wafhed by the fea, which here formed itfelf into a bay of nearly half a mile in diameter. But at prefent the greateft part of this bay is filled up, and gained from the fea, which, from the great fhallownefs of it and daily reception of mud and roots from the river, will eafily fubmit to fuch alterations and encroachments. At Gabs are feveral plantations of palm-trees. The chief branch of trade at prefent confifts in the Al-hennah, which is plentifully cultivated in all their gardens; this beautiful, odoriferous plant grows 10 or 12 feet high, putting out its flowers in clufters, which yield a fmell like camphor; the leaves are ufed by the African ladies to tinge their hair, hands, or feet of a tawny faffron colour, by them efteemed beautiful. Gabs lies at the diftance of 170 miles S. from Tunis. N. lat. 34°. E. long. 10° 2'. Shaw's Travels, p. 113.

GACE', a town of France, in the department of the Orne, and chief place of a canton, in the diftrict of Argentan; 13 miles E. of Argentan. The place contains 1186, and the canton 7640 inhabitants, on a territory of $152\frac{1}{2}$ kiliometres, in 18 communes.

GAD, TRIBE OF, in *Scripture Geography*, a diftrict of Paleftine, which lay on the north fide of Reuben, having the Jordan on the weft, the Ammonites on the eaft, and the half tribe of Manaffeh on the north, reaching from 32° 5' to 32° 50' of latitude, and from 36° 15' to almoft 37° eaft longitude. It was no lefs rich and fertile than that of Reuben, efpecially in pafture grounds. Its chief towns were Mahaneim and Penuel, both fo named by Jacob, Succoth, where he built his booths, Mifpha, or Mafpha-Rabba, the metropolis of Bafhan, fince called Ribboth, and more lately Philadelphia, Ramoth-Gilead or high lands of Gilead, Rogelim, the native place of good old Barzillai, Thifhbi, Sharon, Sophar, Armon, Mogefh, Debbir or Dabbir,

Dabbir, Afhtaroth, Jazer or Jahfor, Dibbon, Aroer, Beth-Haran, and Enon, the place where John baptized; which laft was on the eaft bank of Jordan, between that and Salim, about eight miles S. of Scythopolis.

Gad, in *Mining*, an inftrument ufed to dig out the ore. It is a fmall punch of iron with a long handle of wood. One of the miners holds this in his hand, directing the point to a proper place, while the others ftriking it with a large fledge hammer, drive it into the vein.

The working by this inftrument is thence called gading.

Gad, in *Rural Economy*, a term ufed to fignify a rod with a leathern thong applied to the end of it, and which was formerly much employed in driving ox teams. In fome cafes it had likewife a prick fixed in the contrary end of it, in order to force the animals more powerfully in their work.

Gad-*fly*, in *Entomology*. See Oestrus.

GADAMIS, or Ghedemes, in *Geography*, a country of Africa, W. of Fezzan and 100 leagues from the Mediterranean; it is faid to contain 92 villages. The capital bears the fame name. N. lat. 30° 40′. E. long. 10° 25′.

GADARA, in *Ancient Geography*, a town of Paleftine, in the half tribe of Manaffeh, on the other fide of Jordan, 60 ftadia from the lake of Tiberias. It was the capital of Peræa, and regarded, according to Polybius, as the ftrongeft town of the country. Epiphanius mentions its warm baths.

GADDESDEN, John of, in *Biography*, a phyfician, who lived in the early part of the fourteenth century, and appears to have had very extenfive and lucrative practice. He was the firft Englifhman who was employed as a phyfician at court, being appointed to that office by Edward II.: before his time the king's phyficians had been exclufively foreigners. The ignorance, fuperftition, and low quackery, however, which appear throughout his practice, and which are painted with much life and humour by Dr. Freind, do no great honour to the character of the profeffion in that age. Neverthelefs, he came forward as an univerfal genius; befides affuming the characters of philofopher, philologift, and poet, he undertook every thing that lay within the circle of phyfic and furgery. He talks of his experience in manual operations, pretends to be very expert in bone-fetting, and profeffes himfelf a great oculift. He alfo acquaints us with his great fkill in *phyfiognomy*; "and did defign, if God would give him life and leifure, to write a treatife of *chiromancy*;" but to our unfpeakable grief, this excellent comment upon fortune-telling is loft. He was a great dealer in fecrets, and fome he had which were the moft fecret of fecrets, and did miracles. But his chief ftrength lay in receipts, and without giving himfelf much trouble in forming a judgment refpecting the nature of the cafe, he feemed to think that, if he could mufter up a good number of thefe, he fhould be able to encounter any diftemper. He feems to have neglected no ftratagems, by which he might furprife and impofe on the credulity of mankind, and to have been very artful in laying baits for the delicate, the ladies, and the rich (pro delicatis, pro dominabus, pro divitibus). When he was employed in attending the king's fon, in the fmall-pox, in order to fhew his fkill in inflammatory diftempers, he, with a proper formality, and a countenance of much importance, ordered the patient to be wrapped up in *fcarlet*, and every thing about the bed to be of the fame colour. This, he fays, made him recover without fo much as leaving one mark in his face; and he commends it for an excellent mode of curing. Neverthelefs this man was praifed by Leland, Ovaringius, and others, as a profound philofopher, a fkilful phyfician, and the brighteft man of his age.

His only work, which he produced while refident at Merton college, Oxford, is the famous "Rofa Anglica," which comprifes the whole practice of phyfic; collected indeed chiefly from the Arabians, and the moderns who had written in Latin juft before him, but enlarged and interfperfed with additions from his own experience. Its title is "Rofa Anglica quatuor Libris diftincta, de morbis particularibus, de Febribus, de Chirurgia, de Pharmacopœa." Dr. Freind obferves, that John feems to have made a collection of all the receipts he had ever met with or heard of; and that this book affords us a complete hiftory of what medicines were in ufe, not only among the phyficians of that time, but among the common people in all parts of England, both in the empirical and fuperftitious way. Dr. Aikin remarks that the method of producing frefh from falt water by *fimple diftillation* ("in an alembic with a gentle heat") is familiarly mentioned by this author, even at fo remote a period.

Although devoted to the practice of his profeffion, he was prebendary of St. Paul's, in the ftall of Ealdland. It feems probable from this and other inftances, that the procurement of a finecure place in the church was a method in which the great fometimes paid the fervices of their phyficians. See Freind, Hift. of Phyfic, part ii. Aikin, Biograph. Mem. of Med. p. 9.

GADDI, Taddeo, an hiftorical painter, who flourifhed at a very early period of the reftoration of the art. He was born at Florence in 1300, and became a difciple of Giotto, whofe manner he imitated, and to which he fuperadded improvement in colouring. He poffeffed very confiderable talents as a man of learning; and was highly refpected. His productions were very numerous. The moft confiderable of them is the altar piece in the church of Spirito Santo at Arezzo; where he painted in frefco the Crucifixion of our Saviour. He died of a fever in 1350.

GADE, in *Geography*, a river of England, which rifes in the north part of Hertfordfhire, and runs into the Coln, near Rickmanfworth.

GADEBUSCH, a town of Germany, in the duchy of Mecklenburg; 16 miles W.N.W. of Schwerin. N. lat. 53° 45′. E. long. 11° 14′.

GADELONITIS, in *Ancient Geography*, a country of Afia, on the other fide of the mouth of the river Halys, according to Strabo.

GADEN, in *Geography*, a town of Auftria, 10 miles S.W. of Vienna.

GADENI, in *Ancient Geography*, a people of the Britifh ifland of Albion, according to Ptolemy; and fuppofed by Camden to have poffeffed Tiviotdale, Twedale, Mers, and the Lothians. It is, however, more probable, that they were a fmall nation, inhabiting the more defert and mountainous parts of Tiviotdale and Northumberland. Baxter imagines that their name was derived from the Britifh word "Gadaii," which fignifies to fly.

GADEROW, in *Geography*, a town of Hindooftan, in Guzerat; 42 miles E. of Junagur.

GADEROWS Choultry, a town of Hindooftan, in the Carnatic; 17 miles S.S E. of Tanjore.

GADERSLEBEN, a town of Germany, in the principality of Halberftadt; 20 miles E. of Halberftadt.

GADES, in *Ancient Geography*, *Cadiz*, a town of Spain, at the mouth of one of the arms of the river Boetis. This town feems to have exifted before the eftablifhment of the Phœnicians, and to have been enlarged by them, and rendered a flourifhing place of commerce. Its firft name, given to it by the Celtes, the natural inhabitants of Spain, previoufly to the arrival of colonies of ftrangers, is faid to have been "Cotinufa;" but when the Phœnicians efta-

 blifhed

blifhed themfelves in this town, more than 1500 years before the vulgar era, they called it "Gaddir," an encompaffed place, with reference probably to a wall which furrounded and defended it. According to Pliny and Strabo there were in this place two iflands; one, in which was fituated "Gades," and called by its name, and the other denominated "Erithia" and "Aphrodifias," or the "ifle of Juno." Some authors have fuppofed that this place was alfo called "Tarteffus;" but others, among whom is M. D'Anville, have been of opinion that Tarteffus or Tarteffa was the name of the country, or at leaft of an ifland formed by the Guadalquivir near its mouth. The town of Gades was alfo called in later times "Augufta urbs Julia Gaditana;" and towards the end of the republic it was very populous, infomuch that it vied with Rome in refpect of number of inhabitants. L. Cornelius Balbus, who was of this town, contributed very much to the aggrandizement of it, and conftructed an arfenal for it on the continent. When the Carthaginians made themfelves mafters of a great part of Spain, the town of Gades was fubjected to their dominion; and Livy exprefsly fays, that Afdrubal, in the year of Rome 545 or 546, retired hither in order to avoid falling into the hands of Scipio. After the death of the two Scipios, L. Marcius Septimius, having been made general by the choice of the foldiers, concluded a treaty of alliance with the inhabitants of Gades, or the Gaditani, who had afforded very confiderable fuccours. Gades has furnifhed a great number of medals.

The Tyrian Hercules had a magnificent temple at fome diftance from this city, on the eaft of the ifland, near the main land. This temple was very famous; its fituation in fo remote a place, its antiquity, the incorruptible timber of which it was conftructed, its pillars enriched with ancient infcriptions and hieroglyphics, the labours of Hercules, which were there reprefented; Geryon's trees, which, according to Philoftratus, difcharged blood; the old ceremonies that were practifed; all thefe made it very celebrated, and Gades thought itfelf fecure under the protection of fo great a heroe. Accordingly, as Theron, the king of Spain, was coming to rifle this temple, a panic terror difperfed his fhips, upon the fudden appearance of fire from fome unknown caufe. See HERCULES.

GADIAG, in *Geography*, a town of Ruffia, in the government of Tchernigov; 112 miles S.E. of Tchernigov. N. lat. 50° 24′. E. long. 33°.

GADIBUNDA, a town of Hindooftan, in Myfore; 13 miles N of Chinna Balabaram.

GADITCH, one of the 11 diftricts of the government of Tchernigov in Ruffia, fituated on the Pfol.

GADOLINITE, in *Mineralogy*, a foffil thus named in honour of profeffor Gadolin, who difcovered in it the exiftence of a new earth, called Yttria.

Its colour is an intenfe black, which more or lefs inclines to brownifh black.

It occurs maffive and diffeminated, as alfo, though rarely, in a regular form. Haüy fuppofes its fundamental form to be a rhomboidal oblique prifm; which is a primitive form different from that of any other mineral fubftance.

The fecondary form, from an incomplete cryftal, appeared to the fame celebrated author to be a ten-fided prifm, terminated by three planes.

Internally it is fhining, and its luftre is perfectly refinous. Fracture more or lefs conchoidal. Fragments indeterminately angular, with fharp, fcarcely tranflucent edges. Its hardnefs is nearly that of quartz. It is brittle. Specific gravity 4.04.

Gadolinite manifefts a confiderable action on the magnetic needle. Before the blow-pipe it decrepitates; but if gradually expofed to the heat thus produced, fmall fragments will remain entire, and undergo partial fufion. Glafs of borax is coloured yellow by it.

When reduced to powder, and heated with nitric acid, it is converted into a yellowifh grey gelatine.

The proportions of its conftituent parts are differently ftated by Eckeberg, Vauquelin, and Klaproth.

Eckeberg.		Vauquelin.	
Yttria	47.5	Yttria	35.
Silica	25.0	Silica	25.5
Iron	18.0	Iron	25.0
Alumina	4.5	Oxyd of manganefe	2.0
Lofs	5	Lime	2
	100	Water and carb. acid	10.5
			100

Klaproth.	
Yttria	59.75
Silica	21.25
Black oxyd of iron	17.50
Alumina	0.50
Water	0.50
Lofs	0.50
	100

Prof. Eckeberg has fince repeated his experiments, and is faid to have found the refults ftill more difcordant. But fortunately the external and phyfical characters of this fubftance are fufficiently marked to diftinguifh it from any other that might be miftaken for it.

It is found at Ytterby, in the diftrict of Roflagen, in Sweden, imbedded in feldfpath, with mica; and is accompanied by yttro-tantalite, another fubftance of which the yttria above-mentioned forms a conftituent part.

GADOU, GADOUA, or GADUA, in *Geography*, a country of Africa, on the S. fide of the river Senegal, containing mines of gold, iron, and falt-petre. N. lat. 12° 10′ to 13 10′. W. long. 7° to 9′.

GADUS, in *Ichthyology*, a genus of the Jugular tribe, the head of which is fmooth; gill-membrane with feven flender rays; body oblong, covered with deciduous fcales; all the fins covered with a common fkin; dorfal generally more than one; the rays unarmed; ventral fins flender and ending in a point.

The fpecies are divided into three fections according to the number of the dorfal fins, and the prefence or abfence of the beards at the mouth.

* *Dorfal fins three, mouth bearded.*

CALLARIAS. Colour various; tail equal; upper jaw longer. Gmel. *Gadus balthicus, Torfk*, It. Oel. *Gadus callarias balthicus*, It. Scan. *Afellus varius vel ftriatus*, Jonft. *Baltic Torfk, or Dorfe.*

Inhabits the Baltic, and other feas in the north of Europe. Like moft others of the genus, it feeds on fmaller fifhes, crabs, and worms, in purfuit of which it fometimes enters the mouths of rivers. Otto Fabricius found in the ftomach of this fpecies the fea fcorpion (cottus fcorpio), and the fand launce (ammodytes tobianus) befides crabs, and various kinds of fea-worms. Commonly this fifh weighs about two pounds, or rather lefs; near Rügenwalde they have been taken from feven to eight pounds in weight, and

fometimes

fometimes even twelve or fourteen pounds. Schoneveld fpeaks of one four feet long.

The fpawning feafon is in January and February. The flefh is white, tender, and well flavoured. The Icelanders take it in great plenty, and falt and dry it as an article of commerce. When thus prepared they give it the name of *Titteling*. This fifh is known under various denominations in the north of Europe; in Germany it is called *Dorfch*, in Sweden *Torfk*, and in Denmark *Sma-Torfk*; the Pruffians call it Pamuchel, and at Hamburgh it is known by the name of Scheibendorfch; the Norwegian name is Tare-Torfk, and the Lapland Tare-Torfk, and Rod-Torfk.

The general colour of this fifh is cinereous above, and white beneath, the former fpotted with brown, and fometimes in the young fifh with orange; the upper jaw is longer than the lower, and the tip of the lower jaw furnifhed with a beard or cirrus.

Morhua. Tail fomewhat equal; firft anal ray fpinous. Linn. *Cabliau*, Ström. *Gadus fquamis majoribus*, Bloch. *Morhua*, Bellon. *Molva vel morhua*, Rondel. *Cod, cod-fifh.* Will. Ray. Donov. Br. Fifhes.

The cod attains to the length of four or five feet, and fometimes rather more. The body is of moderate thicknefs, with the abdomen prominent; the head of middling fize, with the opening of the mouth large, and the jaws and palate armed with numerous fharp teeth. The colour of the body variable, according to the age of the fifh, in general cinereous on the back and fides, and fpotted more or lefs confpicuoufly with dull yellow. The lateral line broad and whitifh.

Smaller fifhes, crabs, and worms, of various kinds, are the chief food of the cod: it is a creature of moft voracious appetite, frequently preying on its own fpecies, and its digeftion fo powerful, as to diffolve many of the harder fubftances which it devours. Stones or pebbles are frequently found in its ftomach; and thefe it is fuppofed to fwallow to allay hunger, by retaining the ftomach in a diftended form. It is a highly prolific fifh, nearly a million of eggs being fometimes contained in a fingle roe.

This well-known fpecies occurs in immenfe abundance throughout all the northern feas of Europe, in the vicinity of the polar regions, from whence they migrate towards the fouth, at particular feafons, in queft of food. Though there are many extenfive fifheries of cod in the north of Britain and Ireland, the principal are thofe carried on upon the banks of Newfoundland, the concerns of which are truly prodigious. They are taken only with the hook and line; and being cured, or falted, and dried upon the fpot, are thence tranfported to the continent of Europe. See *Cod* Fishery.

Æglefinus. Whitifh; tail forked; upper jaw longeft. Linn. *Gadus kolja*, It. Scan. *Æglefinus*, Bellon. *Afellus major*, Aldrov. *Haddock*, Will. Donov. &c.

The haddock is a general inhabitant of the northern feas of Europe, and grows to the length of three feet; it feldom, however, exceeds half that length, or about feven pounds in weight. The head is cuneated, and the mouth narrower than in others of its tribe; the eyes large, with black pupil and iris filvery. Its colour is pale-greyifh, tinged with brown above, and filvery-white beneath; the lateral line nearer the back, and of a black colour, and the fins partaking of a tinge of blueifh-grey. There are three fins on the back of this fifh; the firft containing about fourteen rays, the fecond twenty-fix rays, and the third eighteen; in the firft of the two anal fins twenty-two rays, in the fecond twenty, and in the tail from thirty to forty.

At certain feafons of the year, the haddocks affemble together in immenfe fhoals in the northern feas, preparatory to their annual migration to the fouthward, in the courfe of which they vifit the coafts of the Britifh ifles. Some time after their appearance in the German fea, they are equally abundant upon the coaft of Sweden, Denmark, and Holland, and on the fhores of Britain; but after paffing down the channel to the fouthward, as far as the coaft of France, it is not certain that they proceed any further in that direction. It has been obferved, that in thofe periodical migrations which take place in the winter feafon, about the end of November, or beginning of December, it never enters the Mediterranean; neither does it appear in the Baltic, or even pafs the found towards that fea: Copenhagen, and other markets on the coaft of the Baltic, and alfo Hamburgh, being fupplied with the haddock by the fifhermen, who take them in vaft quantities in the fea, off Heligoland.

The haddocks are in full roe at the time of their arrival on our coaft in December, nature having directed them to feek a milder region than that which they inhabit in fummer, as the winter approaches, in order to depofit their fpawn. The old fifhermen affirm, that the females appear in fhoals upon the coaft, which, after laying their eggs, are followed to the fame places by fhoals of the males, who fecundate the eggs depofited by the former.

Haddocks of a large fize are only efteemed good for the table during the winter; thofe of a fmall fize, before they begin to breed, are confidered in perfection at all times; but thefe even are beft in winter. The flefh of this fifh, when boiled, is not fo firm as that of the cod, to which it muft alfo yield in the excellence of flavour; though fome, however, think it preferable. When falted and cured, like the cod, the haddock is by no means indifferent eating.

Upon the firft approach or appearance of a ftorm, the haddocks fink to the bottom of the fea, to feek fhelter till the danger is over; and when they again appear near the furface, on the return of fine weather, they are obferved to have their backs foiled with mud, or fea-weeds, and other marine refufe lodged at the bottom of the water. In the north feas the fifhermen are moft fuccefsful in their fifheries for the haddock during the night-time, thefe fifhes lurking at the bottom of the fea in the day time, but rifing near the furface, as the evening clofes, in queft of food.

Bloch is of opinion, that the black, or dufky colour of the lateral line, in addition to the little cirrus, or beard, at the lower jaw, is a fufficient fpecific criterion of the haddock. There is alfo another very remarkable character of the haddock, a large fquare, or dufky fpot, on each fide of the body, near the head, or a little below the firft dorfal fin, from whence, in the legends of credulous devotion, it has been admitted to be the fame fifh as St. Peter caught with the tribute money in its mouth. The two fpots are confidered as the mark of St. Peter's thumb and finger, which has ever fince remained impreffed on the fides of the whole race of haddocks, to perpetuate the circumftance. But it may be added, that the haddock is not without a rival in the reputed proof of fanctity, the fides of the dory being even more diftinctly marked than thofe of the haddock. Donov. Brit. Fifhes, pl. 59.

Barbatus. Lower jaw with feven punctures each fide. Linn. *Gadus corpore lato*, Bloch. *Afellus latus Lifteri*, Will. *Whiting pout*, Donov. Br. Fifhes, &c.

A marine fifh, confined to the northern parts of Europe, and which rarely exceeds the length of eighteen inches. The body is white; the back tinged with brown; the head fmall; mouth large; upper jaw longer; teeth very fmall, and in both jaws; lips cartilaginous, and connected by a common

common contractile ſkin; tongue ſhort, thick; rough on the poſterior part; the back much arched; vent nearer the head.

Luscus. Firſt ray of the ventral fin ſetaceous. Linn. *Bib*, Donov. Brit. Fiſhes.

The body of this fiſh, like that of the whiting pout, is deep, and the ſides compreſſed; the colour along the back olive; the ſides beautifully gloſſed with a tinge of golden hue, and the lower part pure ſilvery-white. The eye is protected by means of a looſe membrane, which the creature can blow up at pleaſure like a bladder. All the fins, except the ventral, are duſky, the latter white. In the firſt dorſal fin are about thirteen rays, in the ſecond twenty, and in the third nineteen; in the pectoral fins ſixteen; ventral five; firſt anal twenty-three, ſecond anal twenty, and tail thirty-three.

This ſpecies is a native of the European ſeas, and rarely exceeds the length of ten or twelve inches: it appears to be more abundant on the Britiſh ſhores, and ſtill higher northern latitudes than towards the ſouth.

Minutus. Vent in the middle of the body. Müll, *Merlangus*, Bellon. *Anthiæ ſecunda ſpecies*, Geſn. *Aſellus mollis minor*, Will. *Poor*.

Native of the European and Mediterranean ſeas; length ſix or ſeven inches, and of a ſomewhat elongated form; the body ſilvery, ſpotted with black; back browniſh-yellow, and gill-covers punctured; the lower jaw is ſhorter, with fewer rows of teeth; the eyes round and ſilvery, and pupil black; the lateral line narrow and ſtraight; and the tail forked. The abdomen perfectly black within, being lined with a ſkin of that colour.

The appearance of this little fiſh in the Mediterranean excites great joy among the fiſhermen, as it announces an abundant fiſhery, the ſhoals of the poor being immediately followed by an immenſe multitude of the voracious fiſhes, among which the cod, the dorſe, and the haddock, are the moſt conſiderable. It is known at Marſeilles, where, at certain ſeaſons, it occurs in amazing plenty, by the name of *capelan*, or *officier*. The ſpecies feeds on ſmall fiſhes and crabs, and lives, for the moſt part, in deep waters of the ſea: the fleſh is white and well-taſted.

Saida. Fourth ray of the firſt dorſal fin, and fifth ray of the firſt anal fins longer than the reſt; ſecond ray of the ventral fin ending in a long briſtle. Lepechin. *Saida gadus*.

Deſcribed as a new ſpecies in the Tranſactions of the Royal Society of Peterſburg, by Lepechin, who informs us that it inhabits the White-ſea. The length is eight inches; the head of a ſomewhat compreſſed form in front, and rounder behind. The crown black; jaws armed with ſharp, ſetaceous teeth, which are barbed backwards, the upper more obtuſe, the lower more pointed, and a little longer. The eyes are large, with whitiſh pupil, and blueiſh iris; gill-covers ſilvery, ſpotted with black, and compoſed of three laminæ, the loweſt of which is lunate, the next elliptical, the third triangular, and bicuſpidate. The back of the fiſh is convex, ſlightly channelled on the fore part, and of a dirty white colour, with a few confluent blackiſh ſpots; ſides blueiſh, and belly white. The lateral line is ſtraight, and nearer the back; dorſal fins triangular, brown, with whitiſh rays; anal oblong and triangular, with the fore-part of the baſe duſky blue; ventral whitiſh at the baſe, and tail forked. The fleſh is often eaten though dry and tough.

Blennoides. Ventral fins bifid. Pallas. *Blennoid gadus*.

Native of the Mediterranean ſea. The length of this ſpecies is nine inches; the body thick, ſoft, convex, compreſſed, and covered with ſmall ſcales; ſilvery white, and grey towards the back. The head is thick, conic and obtuſe; lips fleſhy, and doubled; teeth minute, unequal, and thoſe in the upper jaw hardly viſible; tongue fleſhy, pointed, prominent, and acute at the edge; palate longitudinally ſtriated; eyes large, with ſilvery iris; gill-covers ſoft; lateral line arched on the fore-part; fins yellowiſh, with very ſmall rays, the dorſal and anal reclined; firſt dorſal fin narrow, and triangular; ſecond narrower; third rather broader and ſhorter; pectoral fins narrow, ſub-falcate, very thin; firſt ray of the ventral fins long, very thick, and bifid; firſt anal fin rounded, ſecond triangular, and tail forked.

** *Dorſal fins three; mouth without beards.*

Virens. Back greeniſh; tail forked. Linn. *Le gade ſey*, Boſc. *Green pollack*.

Gadus virens cloſely reſembles the common pollack, from which it differs in being of a greeniſh colour above, in having the jaws equal; the lateral line ſtraight, and the tail forked. The ſpecies is figured in the work of Aſcanius (p. 3. pl. 21.) This fiſh was long confounded with the common pollack: it is abundant in the northern ſeas, and is known on the coaſt of Norway by no leſs than five different appellations, in its various ſtates of growth. The firſt dorſal fin uſually contains about thirteen rays, the ſecond twenty, and the third nineteen; the pectoral ſeventeen; ventral ſix; firſt anal twenty-four, ſecond twenty, and tail forty.

Merlangus. White; back browniſh; upper jaw longeſt. Donov. Brit. Fiſhes. *Gadus merlangus; albus, maxilla ſuperiore longiore*, Linn. Fn. Suec. *Aſellus mollis*, Jonſt. *Whiting*.

A ſpecies abundant in all the temperate parts of Europe. It is found in the Baltic, Mediterranean, and Northern ſeas, although leſs frequently than in the ſeas that waſh the ſhores of Holland, France, and England, where, at moſt ſeaſons of the year, it is found in great plenty. One circumſtance is worthy of obſervation; the fiſheries for the whiting commence upon the coaſt of France as early as January or February, but on thoſe of Holland, and our own country, not before April or May.

The whiting preys on the ſprat, and the young of the herring, and other fiſhes, crabs, and worms. The ſpawning ſeaſon is in the beginning of the winter, and the young fry make their appearance ſhortly after; theſe increaſe rapidly in ſize till they become ten or twelve inches in length; after which the progreſs of their growth is obſerved to be much ſlower. There are conſiderable whiting fiſheries on the weſtern coaſt of Britain; but the largeſt whitings brought to our markets are thoſe caught in the Dutch ſeas, off the Dogger bank, theſe weighing from four to five pounds, or, ſome ſay, even eight.

The general form of the whiting is ſo well known, as to render its deſcription ſuperfluous. The dorſal fins are three in number, the firſt of which contains about fifteen rays, the ſecond twenty, and the third twenty-one. In the pectoral fin are ſeventeen rays, and in the ventral ſix. In the firſt of the two anal fins are thirty-two rays, in the ſecond twenty, and in the tail thirty-three. Brit. Fiſhes, pl. 36.

Pollachius. Lower jaw longeſt; lateral line bent. Gmel. *Aſellus huitingo-pollachius*, Will. *Whiting pollack*, Ray. Donov. Brit. Fiſhes.

Frequent on ſeveral of the rocky coaſts of Britain, and other parts of Europe. They migrate in large ſhoals, and feed on ſmaller fiſhes, eſpecially the ſand launce. The whiting pollack ſeldom exceeds the length of eighteen inches.

Its

Its head is narrow on the fore part, the eyes large and somewhat prominent; the body sub-olivaceous above, becoming gradually white or silvery on the belly; the fins rather dusky, except the ventral and pectoral, which incline to yellowish, and the tail in a slight degree forked. It is a fish in much esteem for the table.

Carbonarius. Lower jaw longest; lateral line straight. Gmel. *Callarias imberbis*, Klein. *Asellus niger sive mollis nigricans*, Ray. *Le gade colin*, Buff. *Coal-fish*, Penn. Donov. Brit. Fishes, &c.

The coal-fish is an inhabitant of many of the rocky coasts of Britain, and is especially abundant towards the northern parts of the island, as it is also throughout the North and Baltic seas, and even according to Gmelin in the Pacific ocean. In different stages of growth the colours of this fish vary rather considerably. When young, a certain duskiness prevails in the colours, which becomes darker as the fish grow older; and when they have attained their full size, which is from about two to three feet, the back, nose, dorsal fins and tail oftentimes appear of a deep black. Under the pectoral fins is a black spot: the mouth is also of the same colour, and the tongue silvery.

According to Mr. Pennant, the young of this species swarm about the Orkneys and the coast of Yorkshire; in the former of which they constitute the chief support of the poor: and the same writer further states that the fry is known by different names in different places; at Scarborough they are called parrs, and when a year old, billets. Though this information may be correct, we cannot avoid expressing our suspicion that it is the fry of the salmon and not the coal-fish to which Mr. Pennant alludes in detailing the history of the latter species. Nothing at least can be more evident than that the *parr* of this author, and to which he refers as the young of Gadus carbonarius, is no other than the fry of the salmon. Vide Brit. Zool. Description of the *Parr*, No. 78, and figure of the *Parr*, plate 66. No. 78.

The Linnæan character of the fish is concise; Bloch conceives the blackness of the mouth and straightness of the white lateral line sufficient to discriminate the species. The skin of the coal-fish is covered with very small oblong scales. It has three dorsal fins, in the first of which are about fourteen rays, in the second eighteen, and in the third twenty; in the pectoral fin eighteen; ventral five; first anal fin twenty-six; second twenty, and in the tail thirty-three, besides ten very short ones on each side; the tail is broad and forked. Donov. Brit. Fishes.

Merluccius. Beardless; the lower jaw longest. Linn. *Asellus*, Plin. *Asellus primus*, Will. *Hake*, Penn. Donov. Brit. Fishes.

The hake is a native of the North and Mediterranean seas. It is of the migratory kind, frequenting our shores in immense shoals during the mackarel and herring seasons, appearing for the first time in June, and then again in September, in pursuit of those fishes. The flesh of the hake, though firm and white, is in little esteem for its flavour, and is seldom eaten except by the lower orders of people. They are caught on our coasts chiefly for the purpose of salting and drying them for exportation. Vast quantities, it is said, are sent every year to the port of Bilboa, and other parts of Europe. When cured it is well known by the name of Poor John, or stock-fish.

On the coast of France, the hake is also taken in great abundance, and is cured, as in England, for exportation. By one of the French writers it has been remarked, that since the great naval engagement in 1759, between the French and English, the hake has been found in vast numbers at all seasons of the year, in the sea that washes the shores of Belleisle; and he conjectures that they were first attracted to that spot in particular by the number of dead bodies that were here committed to the deep on that memorable occasion. Some of the hake on that coast we are told measure six or seven feet in length.

The hake is a most voracious fish, and besides feeding, as before observed, on the mackarel and herring, preys also on other small fish, crabs and worms. For its carnivorous mode of life its teeth are perfectly well adapted, for these are numerous, strong, sharp, and much recurved, which give it no small degree of advantage in securing its prey. The eggs found in the body of the female are of an orange colour, and about the size of a grain of millet.

The form of this fish is not inelegant: the head is long and rather depressed. In the first dorsal fin are nine rays, in the second thirty-eight; pectoral fin fifteen rays; ventral eight; anal thirty-six; and in the tail eighteen.

Molva. Mouth bearded; upper jaw longer. Linn. *Gadus longa*, It. Wgoth. *Gadus droso dipterygio, maxilla superiore longiore*, Bloch. *Enchelyopus*, Klein. *Asellus longus*, Will. *Ling*, Donov. Brit. Fishes, &c.

A northern fish, bearing a remote resemblance to the common cod fish, from which it is distinguished by its more elongated form, and in having only two dorsal fins instead of three. Its food consists of smaller fishes, worms, crabs and other similar marine productions. In the months of February, March, and April, or even as late as May, it is in season for the table; in June it visits the shores to deposit its spawn, and is not in perfection after that time till the ensuing spring. The prevalent colour is whitish, with the back pale-brownish. The head is large, and obtuse; eyes with black pupil and white iris; mouth large; tongue white and thin; body round, and covered with very thin scales; fins (except the anal, which is cinereous,) blackish, edged with whitish, and a black spot towards the end of the dorsal fins. The ling grows to the length of six or seven feet, and is taken in abundance in the north, where it is cured with salt, and forms an article of exportation to the more southern parts of Europe, which the ling does not inhabit.

Albidus. Chin with a cirrus; ventral fins long, and bifid. Brünn.

A species about four inches in length, of a whitish colour, soft, oblong, and slightly compressed. The head is pale sanguineous, above flattish, with the sides compressed, and two spines behind the eyes. The lower jaw shorter, with seven punctures beneath each side; teeth small, sharp, and crowded; eyes large with the iris white; lateral line straight; first dorsal fin small and blackish at the tip; hinder whitish, spotted with black, the edge and hind part black; anal whitish, the posterior part black; tail rounded and blackish. A native of the Mediterranean.

Tau. Bearded; gill-covers three-spined; first dorsal fin with three rays. Gmel. *Gadus tau; cirris plurimis*, Bloch.

Described by Dr. Garden as a native of Carolina, and where, according to that observer of nature, it is called the toad-fish. The body is smooth and mucous, above brown, beneath whitish; back and fins spotted with white, and covered with soft, thin, very small, brown scales of a rounded form, and edged with white. The head is large and broad; the eyes vertical and large, with the pupil black and iris golden; and on each side a double row of small tubercles: between them and the nape a cavity and transverse yellow streak; palate each side with a double row of teeth, upper jaw with many, lower only two rows of sharp uneven teeth; cirri numerous, on the lower jaw only, and disposed in a semilunar manner. Gill-covers of two pieces, the membrane large and loose. The pectoral and ventral fins are pointed; the

the firft ray of the pofterior one ftrong, rigid, and very long. Tail rounded with the rays forked.

Lota. Bearded; jaws equal. Linn. *Silurus cirro in mento unico*, Art. *Botlatriæ, Trifeus*, Salvian. *Lota*, Rondel. *Burbot*, Donov. Brit. Fifhes.

The burbot inhabits frefh waters in many parts of Europe and Siberia; feeds on fmaller fifhes, and grows to the length of two, or even three feet. As an article of food the flefh is efteemed delicious. The head of the burbot is large, and rather broad; the eyes fmall, with blueifh pupil, and yellow iris; mouth large; jaws with feven rows of fharp teeth. The lower jaw has a fingle beard, the nofe two; the tongue, and alfo the gill-membrane broad; lateral line ftraight; dorfal and anal fins long and narrow; and the vent in the middle of the belly.

Mustela. Five beards; firft dorfal fin obfolete. Gmel. *Five-bearded cod*, Donov. Brit. Fifhes.

The greateft length of this fpecies is mentioned as nineteen inches, and it rarely attains to near that fize. It feeds on crabs, worms, and fmall teftaceous animals, and though not apparently common inhabits moft of the European fhores. The colour of this fifh is olive, or olivaceous on the back and whitifh beneath, with the fins pale brown, except the pectoral, which are tinged with yellowifh, and the ventral, which are white at the bafe, and towards the tip rofy. The firft dorfal fin confifts of one fmall diftinct ray, and many very obfolete; the fecond of forty-nine rays; the pectoral of fourteen; ventral fix; and tail of twenty-four.

Tricirratus. Three beards; firft dorfal fin obfolete; body fpotted. Donov. Brit. Fifhes. *Gadus muftela β*, Gmel. *Muftella vulgaris*, Rondel. *Sea loche*, Ceftriæ. *Whiftle fifh*, Cornubiæ, Will. *Rockling*, Jago. *Three-bearded cod*, Penn.

Bloch and Gmelin have followed Willughby in making this a mere variety of the Gadus muftela, or five-bearded cod; an idea certainly founded in error, the two fifhes exhibiting characters fo entirely diftinct that it is impoffible they can be of the fame fpecies. This fubject is difcuffed, and the point as it is prefumed determined, in a fatisfactory manner from an attentive comparifon of the two fifhes in difpute in "Donovan's Hiftory of Britifh Fifhes." It is there obferved that the number of beards or cirri in the fpotted kind, or rockling, never exceed three, nor is the number of thofe on the true muftela ever lefs than five. This alone would be in our opinion fufficiently demonftrative of a fpecific difference, but they are furthermore diftinguifhed by other peculiarities no lefs decifive. There is, for inftance, a diffimilarity in the form, and alfo in colour, the five-bearded cod being thicker in proportion to its length, and with the colour above olivaceous, beneath whitifh; while on the contrary a general hue of orange prevails in the other, and this in a remarkable degree on the abdomen, the head, and ventral fins. The body of the latter is alfo fpotted in an elegant and confpicuous manner with fufcous, no trace of which is perceptible in G. muftela. For thefe and other reafons the author of the above mentioned work defcribed the two kinds as diftinct, and affigned the hitherto fuppofed variety of muftela the following new fpecific character under the title of *Gadus tricirratus*; cirris tribus, pinna dorfali priore exfoleta, corpore maculato.

The three-bearded cod, or rockling, appears from our own refearches to be moft common on the rocky fhores of the weftern counties of Britain. Its length is from twelve to eighteen inches. The firft ray of the anterior dorfal fin is fmall, yet diftinct, from the reft which are minute and numerous. The fecond dorfal fin confifts of fifty-four rays; pectoral fin twenty; ventral fins flefhy, with the fecond ray longeft; anal fin with forty-fix rays, and the tail twenty-four.

Dr. Wallbaum defcribes another fifh (a native of Ruffia) as a variety of muftela under the name of *rufficus γ cirro unico*. Gmelin alfo feems to doubt whether the fpecies Mediterraneus defcribed by Linnæus from the Muf. Ad. Fr. and referred by that writer to the fection with only one dorfal fin, may not be another variety of the fame fifh.

Cimbrius. Cirri four; firft dorfal fin obfolete, the firft ray fpear-fhaped. Gmel. *Le Cimbre*, Bofc. *Cimbrian gadus*.

Defcribed as a native of the Northern and Atlantic feas, and as bearing a clofe affinity with the fpecies muftela, from which it is faid to differ chiefly in having the firft ray of the anterior dorfal fin divided at the tip in the form of the letter T, or rather in two filaments difpofed horizontally. There is a fingle beard on the upper, and another on the lower lip, befides two over the noftrils.

*** *Dorfal fin only one.*

Mediterraneus. Upper jaw with two cirri; lower with one. Linn.

Native of the Mediterranean. Lacépede refers it to the Blennius genus, as there are only two rays in the ventral fins.

Brosme. Lower jaw longeft; tail round, and with the dorfal and anal fin edged with white; ventral fins flefhy with five cirri. Donov. Brit. Fifhes. *Gadus Brofme*; mouth bearded; tail oval and pointed. Gmel. *Brofme*, Ström. *Torfk*, Penn.

So much obfcurity has hitherto prevailed over the hiftory of this curious fifh, that we fhall be readily excufed by the curious reader for entering on this fubject at fome length. "The torfk of the Norwegians, Swedes, and Danes (as we have before obferved in another place) is a very different fifh from that known in Scotland under the fame name; a circumftance that has given rife to much mifunderftanding among Englifh writers refpecting thofe two fifhes. The torfk, or dorfk of the north of Europe, with the exception of Scotland only, is the gadus callarias of Linnæus, a fifh diftinguifhed in a particular manner from the Scotch torfk, by having three fins on the back as we find in our common cod-fifh and haddock, while the latter is furnifhed with only one dorfal fin: they are alfo materially diftinct in other refpects; but thefe are the moft decifive and unerring characters that prevail in thofe two fpecies.

"The fame name being common to both thofe fifhes in different countries, it was long fuppofed, and admitted without farther inveftigation, that they muft be of the fame fpecies. Pennant was led into this error through that circumftance: he had learnt that there exifted a fifh called the torfk, in the Orkneys, and northern parts of Scotland, and not having feen it, concluded it to be of the fame kind as Linnæus defcribes under that name in his Fauna Suecica. At a fubfequent period this miftake was corrected on the information of Mr. Low, who fent Mr. Pennant the defcription and drawing from which the plate was engraven, that appears in the laft edition of the Britifh Zoology. Mr. Low was enabled, from his own immediate obfervations, to determine, that the torfk of the Swedes is not the torfk of the Scotch, which renders his account not a little interefting. The torfk it feems, from his account, or as it is called in the Shetlands *tufk* and *brifmak* (perhaps corrupted from brofme, its Norwegian name) is a northern fifh, which as yet has not been difcovered lower to the fouthward than the Orkneys, and is even there rather fcarce. In the feas about Shetland it fwarms, and forms either dried or falted and packed in barrels a confiderable article of commerce.

 "Ström,

"Ström, a Norwegian clergyman, in his hiftory of Sondmör, fpeaks to the fame effect; he informs us in the north it is called brofme, and being found in great plenty in the feas adjacent to Sondmör, there conftitutes an article of extenfive trade either falted, and barrelled, or dried. His fpecific defcription of brofme is in Latin gadus monopterygius, ore cirrofo, cauda ovali acuta; and a figure of the fifh, very well agreeing with this defcription, is given in the mifcellaneous plate that accompanies the firft volume.

"There are three different varieties of the Danifh torfk, in the works of Afcanius, all which agree with the Linnæan defcription of gadus callarias. According to Afcanius all thefe are well known to the Danifh fifhermen by the name of torfk, and to the Germans by that of dorfk; they are taken in abundance in the fea between the ifland of Bornholm, and the north of Bergen, in the Categat, and the Baltic. This writer alfo figures, and defcribes the brofme (Ic. pl. 17.) in a manner fo far correct at leaft as to leave no doubt of its being the fame as the torfk of Scotland; the latter fpecies he obferves connects the gadus with the blennius genus, and is, from its refemblance to the blenny, called brofme by the fifhermen: that being the name by which the blenny is diftinguifhed amongft them. We have alfo the authority of Bloch to fhew, that the gadus callarias is the torfk of the Baltic, and the brofme a different fifh.

"The refult of thefe remarks will be fufficient to prove that the torfk of Scotland agrees in no refpect, except in name, with the torfk of the other northern parts of Europe, and that the Scotch torfk is beyond doubt the brofme of thofe countries." *Donov. Brit. Fifhes.*

In addition to the above extracts the following more general obfervations may with propriety be felected.

There can be no difpute that much of the ambiguity, prevalent in regard to this fifh, may be traced to the very fimple caufe of having been fometimes defcribed by authors from the dried inftead of recent ftate, as in this cafe it certainly does exhibit a very remarkable difference; a fact we have ourfelves obferved in endeavouring to preferve an example of the fifh which we had an opportunity of inveftigating in its perfect condition, and indeed poffefs at this time. This alteration may be explained with little difficulty: the fins and tail, when the fifh is alive, or recent, are invefted with fkin of fuch a flefhy nature as to conceal in a great meafure the number, and even fituation of the rays that lie within; but in the procefs of drying this flefhy fkin fhrinks fo materially as to leave the rays almoft bare. The tail, thus divefted of its flefhinefs, inftead of retaining its rounded figure as in the living fifh, affumes the more pointed form of the fkeleton of the tail, for the central rays are in reality longer than the reft, though they appear fo only in a very flight degree in the recent ftate. From a due confideration of this circumftance we may eafily reconcile the two characters "cauda ovali acuta," and "cauda rotundata" which have been afcribed to the torfk, the former being its appearance in the dried, and the other in its recent ftate. Gmelin adopts the firft of thefe, and the confequence has been that in the Englifh tranflation of the Syftema Naturæ, the Scotch torfk is erroneoufly admitted as a fpecies diftinct from the gadus brofme, under the name of Scoticus.

Although the brofme or Scotch torfk fwarms in the north feas, it is fcarcely ever feen more to the fouthward of Britain than Caithnefs in Scotland, and even there very feldom. It is fometimes brought from Shetland to London for fale with other falt-fifh. In this ftate it is eafily diftinguifhed by its fingle dorfal fin which extends from within a fhort diftance of the head to the bafe of the tail.

The length of this fifh is about twenty-five inches; the colour of the body above pale greyifh, teftaceous, beneath white: the dorfal, anal, and caudal fin or tail of the fame colour as the upper part of the body, very prettily fpeckled with white, and blueifh, towards the margin blotched with purple, and a fillet of white forming the extreme border. The pectoral fins were fine yellow, and the ventral reddifh with the tips dufky.

GADWALL, in *Ornithology*, called alfo the *grey*, a fpecies of the anas, or duck tribe, diftinguifhed fpecifically by having the wing-fpot rufous, black and white. The bird is about nineteen inches in length, with the bill flat, and of a black colour; the legs tawny; rump black; back brown with pale tranfverfe undulations, and the breaft and belly grey varied with white. It is a native of northern Afia and Europe, and fometimes vifits our coafts in fevere winters. The gadwall is anas ftrepera of Gmelin. Donov. Br. Birds, &c. See DUCK.

GÆA, in *Ancient Geography*, a town of Arabia Felix, placed by Ptolemy in the interior of the country, and called by Ammianus Marcellinus Geapolis.

GÆELÆUM, *earth-oil*, in *Natural Hiftory*, a name given by fome of the old writers to the petroleum, or, as we ufually call it, oil of petre.

GAEL, or *Southern Celts*, formed the earlieft population of Great Britain; and were called "Guydels" by the Welch, who regard them as their predeceffors, and who remark, that the moft ancient names, even in Wales, are Guydelic, not Cumraig or Welch. Thefe Gael appear to have proceeded from the neareft fhores of France and Flanders. The original Gaelic inhabitants feem to have almoft entirely evacuated the country, and to have retired to Ireland, which was alfo originally peopled from Gaul. There, and in the Highlands of Scotland, to which a Gaelic colony paffed from Ireland, the Gaelic dialect of the Celtic language ftill exifts.

GAELIC, or ERSE. This is the name of that dialect of the ancient Celtic language, which is fpoken in the Highlands of Scotland. According to the opinion of antiquarians, the Celtic, at the time of the Roman invafion, was univerfally fpoken all over the weft of Europe. Though it is divided into a variety of dialects, yet they all bear the cleareft internal proofs of their being defcended from one common origin. The moft remarkable dialects of the Celtic, ftill in exiftence, are the Gaelic, the Welch, the Manks, the Irifh, and the Cornifh, the laft of which appears to be nearly loft. To this lift may juftly be added the dialect, which is fpoken by the natives of the province of Bretagne in France. The Gaelic, which, from a variety of caufes, is preferved in a confiderable degree of its original purity, is bold, expreffive, and copious. It derives no affiftance from the languages either of Greece or Rome, from which it differs in its ftructure and formation. Having its affixes and prefixes, it greatly refembles the Hebrew, particularly in the inflexions of its nouns and verbs. Like the modern French it only knows two genders, the mafculine and feminine. If ever the Gaelic poffeffed an alphabet peculiar to itfelf, no traces whatever of it now remain. Nor can it boaft of any original literary production, unlefs the poems of Offian be allowed to form an exception.

Of late the fcriptures and other religious books have been very correctly tranflated into Gaelic, from which the inhabitants of the Highlands derive confiderable advantages. Notwithftanding every difcouragement and oppofition on the part of the Highland proprietors, who confider, perhaps not without reafon, the exiftence of the Gaelic as operating againft the general improvement of that part of the kingdom, it is fo far from being on the decline, that it has actually,

within the laſt century, in many places, encroached on the Engliſh. Such as would wiſh to arrive at accuracy in topographical knowledge, would do well to ſtudy Gaelic, as more than two-thirds of the names of places in the united kingdom are evidently of Celtic extraction. Some months ago a chapel has been opened in London, where divine worſhip is performed in Gaelic according to the forms of the church of Scotland.

GÆRTNER, Joseph, in *Biography*, a botaniſt eminently diſtinguiſhed for his attention to fruits and ſeeds, with a view to the more certain diſcrimination of the genera of plants, was born at Calw in the duchy of Wirtemberg, March 12, 1732. His father, phyſician to the duke of Wirtemberg, and his mother, whoſe maiden name was Wagner, both died in his early youth. He was at firſt deſtined by his ſurviving relations for the church, and received the earlieſt parts of his education at Tübingen and Stutgard; but not proving ſuitable to the profeſſion which had been choſen for him, he was directed, with no better ſucceſs, to the law. Having had an early bias towards the ſtudy of natural hiſtory, he reſorted to phyſic, as moſt congenial to his diſpoſition, and removed to the celebrated univerſity of Gottingen in the 19th year of his age. Here the lectures of the great Haller and others confirmed and inſtructed him in the darling objects of his purſuit, anatomy, phyſiology, and botany, and ultimately decided him to devote himſelf to theſe ſtudies, rather for his own information and amuſement, than as a means of advancement in the practice of phyſic. Thus Gærtner became a profeſſed naturaliſt, and undertook a tour through Italy, France, and England, in the purſuit of knowledge in this line of ſtudy. He, however, took the degree of doctor of medicine on returning to his own country, and publiſhed an inaugural diſſertation on the urinary ſecretion, after which he devoted two years to the ſtudy of mathematics, optics, and mechanics, conſtructing with his own hands a teleſcope, as well as a common and ſolar microſcope. In the ſummer of 1759, he attended a courſe of botanical lectures at Leyden under the celebrated Adrian Van Royen, and formed an intimate friendſhip with David Van Royen, the nephew, and afterwards ſucceſſor, of the former. He had for ſome time acquired the uſe of the pencil, in which he eminently excelled, and which ſubſequently proved of the greateſt uſe to him in enabling him to draw the beautiful and accurate figures of the books he publiſhed. Having beſtowed great attention upon the obſcurer tribes of marine animals and plants, particularly with a view to the mode of propagation of the latter, as well as of other cryptogamic vegetables, he reviſited England, and ſpent ſome time here, as well in ſcrutinizing the productions of our extenſive and varied coaſts, as in converſing with thoſe able naturaliſts Ellis, Collinſon, Baker, and others, who were aſſiduouſly engaged in ſimilar purſuits. He communicated a paper to the Royal Society on the polype called *Urtica marina*, and the *Actinia* of Linnæus, comprehending deſcriptions and figures of ſeveral ſpecies, which is printed in the 52d volume of the Philoſophical Tranſactions; and he prepared ſeveral eſſays on the anatomy of fiſhes, and other obſcure matters of animal and vegetable phyſiology, part of which only has hitherto been made public. Soon afterwards Dr. Gærtner became a member of the Royal Society of London, and of the Imperial Academy of Sciences at Peterſburg. In 1768, he was inſtituted profeſſor of botany and natural hiſtory in the place laſt mentioned, and about a year afterwards he began to plan, and prepare materials for, the great work on which his eminent reputation reſts, the object of which was the illuſtration of fruits and ſeeds, for the purpoſes above mentioned. His ſituation at Peterſburg however ſeems not to have ſuited either his health or diſpoſition. After having performed a journey into the Ukraine, in which he collected many new or obſcure plants, he reſigned his profeſſorſhip at the end of two years, ſteadily refuſing the penſion ordinarily attached to it, and retired in the autumn of 1770 to his native town, where he married a lady of the name of Mutſhelin, and gave himſelf up to domeſtic and ſcientific tranquillity. At the end of eight years he found it neceſſary, for the perfection of his intended work, to reviſit ſome of the ſeats of ſcience in which he had formerly ſtudied, in order to re-examine ſeveral botanical collections, and to converſe again with perſons devoted to ſimilar inquiries with his own. Above all he was anxious to profit by the diſcoveries of the diſtinguiſhed voyagers Banks and Solander, who received him with open arms on his arrival at London in 1778, and, with the liberality which ever diſtinguiſhed their characters, freely laid before him all their acquiſitions, and aſſiſted him with their own obſervations and diſcoveries. A new genus was dedicated to Gærtner by his illuſtrious friends in their manuſcripts; but this being his own *ſphenoclea*, has been ſuperſeded by another and a finer plant; see Gærtnera. He viſited Thunberg in his return through Amſterdam, that diſtinguiſhed botaniſt and traveller being then lately arrived from Japan; nor were the acquiſitions of Gærtner leſs conſiderable from this quarter. He further enriched himſelf from the treaſures at Leyden, laid open to him by his old friend Van Royen; and arrived at home laden with ſpoils, deſtined to enrich his intended publication.

Here however his labours and his darling purſuits were interrupted by a ſevere diſorder in his eyes, which for many months threatened total blindneſs; nor was it till after an intermiſſion of four or five years that he was able to reſume his ſtudies.

At length he gave to the public the firſt volume of his long-expected work, *de fructibus et ſeminibus plantarum*, printed at Stutgard in 1788, and containing the eſſential generic characters, with particular deſcriptions of the fruit, of 500 genera, illuſtrated by figures of each, admirably drawn by himſelf, and neatly engraved in 79 quarto plates; a long anatomical and phyſiological introduction is prefixed, in which he defines and explains the nature of the parts of fructification, eſpecially of the fruit and ſeed. In this eſſay he denies the exiſtence of real flowers, and conſequently of proper ſeeds, in *Fungi*, and other cryptogamic vegetables, in which Hedwig and others conceive they had detected the organs of impregnation as well as real ſeeds. Gærtner conſiders the latter as *gemmæ* or buds, and not ſeeds produced by ſexual impregnation. He even denies the celebrated Hedwigian theory of moſſes. He changes the name of *germen*, applied by Linnæus to the rudiments of the fruit in old plants, to the old and erroneous term *ovarium*. (See Germen.) In the detail of his work he often corrects the great Swediſh naturaliſt, with more or leſs juſtice, but not always with candour, and changes his names frequently for the worſe. In ſynonyms he is not always exact, copying them, as it appears, from errors of the preſs occaſionally tranſcribed from other authors, without turning to the books quoted.

In the definition and anatomical elucidation of the parts of the ſeed, Gærtner is truly excellent, though it has been doubted of late whether what he terms *vitellus* has any real exiſtence diſtinct from the cotyledons, and Dr. Smith is of opinion that he has proved the contrary. (See Tranſ. of the Linnæan Soc. vol. 9th 204.) In his deciſions in difficult caſes concerning the eſtabliſhment of particular genera, Gærtner, like all botaniſts whoſe fixed attention is bent

upon one part of the fructification in preference to the reft, fometimes gives too much importance to that part, lofing fight of the great maxim, that "the genus fhould give the character, not the character the genus." Notwithftanding thefe flight defects, the work of Gærtner is one that marks an era in botanical fcience, not only directing, but even forcing the attention of botanifts, to parts which the Linnæan fchool had too much neglected, but which can never in future be overlooked. The fecond volume of this immortal work appeared in 1791, illuftrating 500 more genera, on the fame plan with the former, in 101 plates, in which the compound flowers are treated with peculiar care and fuccefs. The preface of this volume is dated April 6, 1791, but little more than three months before the death of the author, which happened on the fourteenth of July 1791, in the 60th year of his age. He is faid, though ftruggling for fome time preceding with debility and difeafe, to have finifhed a defcription and drawing of the *Halleria lucida* but the evening before his departure. He left one fon, to whom he gave an excellent education, and who has proved worthy of his diftinguifhed father, in publifhing his inedited works, and continuing with fuccefs the fame inquiries. Deleuze in Sims and Konig's Annals of Botany, v. 1. 73.

GÆRTNERA, in *Botany*, in honour of Jofeph Gærtner, M. D. (See the laft article.) Schreb. 290. Willd. Sp. Pl. v. 2. 550. (Hiptage; Gærtn. v. 2. 169. t. 116. Molina; Cavan. Monad. diff. 9. 435. t. 263. Lamarck Illuftr. t. 349.) Clafs and order, *Decandria Monogynia.* Nat. Ord. *Tribilatæ*, Linn. *Malpighiæ*, Juff.

Gen. Ch. *Cal.* Perianth inferior, of one leaf, in five deep, oblong, obtufe, fpreading, nearly equal fegments, permanent. *Cor.* Petals five, roundifh, large, flattifh, nearly equal, fpreading, with very fhort claws; their margin jagged and fringed. *Stam.* Filaments ten, thread-fhaped, flightly united at their bafe; nine of them more flender, nearly erect, fhorter than the corolla; the tenth thicker, the length of the adjoining petal, incurved at the top; anthers oblong, quadrangular; nine of equal fize; the tenth, on the longeft filament, rather the largeft. *Pift.* Germen fuperior, fmall, three-toothed; ftyle thread-fhaped, lateral, incurved, the length of the longeft ftamen, permanent; ftigma acute. *Peric.* Capfule woody, of one cell. without valves, roundifh, crowned with four lanceolate, obtufe, unequal, coriaceous wings, of which the largeft is erect, the two leffer fpreading, and the leaft afcending. *Seed* folitary, roundifh, deftitute of albumen.

Eff. Ch. Calyx in five deep divifions. Petals five, fringed and jagged. One ftamen longer than the reft. Capfule with four unequal wings, of one cell, without valves.

1. G. *racemofa.* Vahl Symb. fafc. 3. 58. Roxb. Coromand. v. 1. 19. t. 18. Andr. Repof. t. 600. (Bannifteria benghalenfis; Linn. Sp. Pl. 611. B. tetraptera; Sonnerat. Ind. Orient. v. 2. 238. t. 135. Sida Pou; Rheede Hort. Mal. v. 6. 109. t. 59.)—Native of the Eaft Indies, and the only fpecies known. The *ftem* is woody and climbing. *Leaves* oppofite, ftalked, laurel-like, elliptic-oblong, fmooth and entire. *Clufter* terminal, erect, of numerous elegant *flowers*, fomewhat refembling thofe of the horfe chefnut, their petals being white, and one of them efpecially broadly marked with yellow. This fhrub flowers in India during the cool and rainy feafon, and, according to Dr. Roxburgh, is cultivated throughout the coaft of Coromandel, on account of the beauty and fragrance of its bloffoms. That gentleman fent a plant to the late lady Amelia Hume, in whofe garden it flowered in the fpring of 1810, for the firft time probably in Europe.

GÆSATI, in *Ancient Geography*, a warlike people among the Gauls, who are defcribed by Polybius as ready to fight for any nation which would pay them; accordingly their name denotes "hirelings."

GÆSUM, or GÆSUS, a river of Afia Minor, which ran between Miletus and Priene, and difcharged itfelf into a marfh, and from thence into the fea.

GÆTA, in *Geography*, a fea-port town of Naples, in the province of Lavora, anciently "Cajeta," fo called, according to Virgil, from Æneas's nurfe. It is fituated on the point of a promontory, and joined to the continent by a narrow ifthmus northward, the reft being furrounded by the fea, fo that it forms a peninfula. Ferdinand II. of Aragon, apprifed of its importance, fortified it with good walls and a citadel; and to thefe other fortifications have been fince added, which, together with its fituation on a rock, renders it very difficult of accefs. The fea flows into its moats, which are both broad and deep, fo that its entrance is defended by armed veffels, and its citadel, built on an eminence, commands the city. Its harbour, anciently repaired by Antoninus Pius, is good and fecure, and its gulf abounds with fifh particularly fturgeons, of which the cavear is made. The town is not large, the ftreets are narrow, and the houfes are built on porticoes.

It is the fee of a bifhop, fuffragan of Capua, which was transferred thither after the Saracens had ruined Nola in the year 956. Its vicinity is pleafant, and the foil very fertile. 40 miles N.W of Naples. N. lat. 41° 15'. E. long. 13° 28'.

GÆTANO, St., a town of New Navarre; 60 miles S. of Cafa Grande.

GÆTULIA, in *Ancient Geography*, a country of Africa, the fituation and limits of which are not accurately afcertained; and, indeed, they do not feem to have been always the fame. In Pliny's time, the Gætulians poffeffed a confiderable part, at leaft, of Tingitania. Feftus Avienus fixed their eaftern boundary not far from the weftern confines of Marmarica. Strabo intimates that the Gætulians formed a large nation, taking up a confiderable part of Libya Interior, and poffeffing fome territories in the neighbourhood of the Syrtes. Pliny maintains that Gætulia was terminated on the fouth by the river Nigris, called by Ptolemy Niger, which, according to him, feparated it from Ethiopia. The northern limits of this undefined country feem to have been contiguous to, and frequently coinciding with, the fouthern parts of Numidia and the Mauritaniæ, and it could not have extended to any great diftance in the Sahara. Dr. Shaw (Travels) intimates, that the proper Gætulia did not reach farther to the eaft than the meridian of Siga, provided that Tackumbreet be the ancient Siga, as he imagines; fince he affirms that the Mælanogætuli and Garamantes occupied the tract behind Numidia, Africa Propria, and the Regio Syrtica, from that meridian to Cyrenaica. In another place, however, he fixes fome Gætulian tribes in the remoteft part of the diftrict of Zaab, and meridian of Conftantina, above fix degrees more to the eaftward than Siga. We may here obferve that Guzula, or Gezula, a province of the kingdom of Morocco, at the foot of Mount Atlas, has preferved fome traces of the ancient Gætulia. As the Gætulians, before the time of Jugurtha, led their flocks from pafture to pafture, living generally in tents, without any fixed habitation, their country will not prefent to view many towns. Philoftratus fays, that they inhabited the interior part of mount Abinna, or Abyla; and confequently by intermixing them with the Maurufii, allows fome of them to have dwelt in towns. Pliny alfo intimates, that they poffeffed in his time great part of Maffæfylia; and Apuleius affigns them fome diftricts at leaft of Numidia Propria; but Pliny and Ptolemy

render it indifputable, when they mention the cities of Autolala and Talubath, as appertaining to the Gætulians. The principal tribes of Proper Gætulia were the Baniuræ, Darræ, and Autololes. The Baniuræ, probably, bordered upon Tingitania, as the Darræ did upon the Ethiopians, called Perorfi, and the Pharufi. The Autololes feem to have been much the moft powerful, and to have fpread themfelves over that part of Tingitania bordering on the coaft of the Atlantic ocean. Their capital city, Autolala, from which they derived their name, ftood betwixt the Subus and the Salathus, the only two rivers of note except the Gir and the Nigir, that watered Gætulia. As the Sahara rofe near the fouthern foot of Mount Atlas, this country was without doubt for the moft part fandy and defert; though it was interfperfed with fruitful fpots. Mount Sagapole, the limit of Gætulia on the fide of the Melanogætuli, and containing the fources of the Subus and Salathus, feems to have been the only remarkable mountain in the region we are now defcribing. The only curiofity worthy of particular notice was the vaft quantity of the purple-fifh produced in that part of the Atlantic ocean that wafhed the Gætulian fhore, with which the rocks on this coaft were frequently covered.

According to Jofephus and Jerome, Chavilah or Havilah, the fon of Cufh, was the father of the Gætulians; and therefore they were called Evilæi or Havilæi. Havilah, or Chavilah, having fettled in Arabia Felix, gave to his defcendants the name of Chauletæi and Chaulefii; and hence it has been inferred that Gætulia was firft peopled from Arabia Felix. The firft Gætulians, according to the Punic hiftorians, were fome of the moft ancient inhabitants of Africa, extremely rude and barbarous, without any form of government, laws, or manners. They lived upon the flefh of wild beafts, eating upon the ground, after the manner of cattle; they roved about the country, lodging wherever the night furprifed them. Some authors, however, believe, that the Gætulians, though rude and barbarous, at leaft near the Roman times, were under the direction of certain phylarchs, or heads of Kabyles, as their pofterity are at this day. Their peculiar laws and cuftoms are now unknown. Their religion probably refembled that of their neighbours, or of their progenitors, the ancient Arabs; and as they were partly defcended from the Perfians, or intermixed with them, they might profefs the Magian religion. Their language muft undoubtedly have borne a near refemblance to the ancient Arabic, and other oriental tongues. In the times of Herodotus and Scylax the Gætulians muft have been an obfcure people, as thofe writers take no notice of them. The firft authors that mention them were probably fome of thofe old hiftorians, whofe works furnifhed Livy with information concerning them; and from whom we learn, that a corps of that people ferved under Hannibal in the fecond Punic war. Salluft informs us, that Jugurtha inftructed the Gætulians in military difcipline; and they ferved that prince more effectually by plundering the allies of the Romans, than by their bravery in time of action; for the army he had raifed and difciplined in Gætulia was eafily routed by Marius under Cirta. That part of Gætulia which was under the dominion of Juba revolted to Julius Cæfar; but when that with Numidia was reduced into a Roman province, we cannot pofitively affirm; efpecially fince Auguftus beftowed a part of Gætulia, probably this, with the Mauritaniæ, on the younger Juba, as an equivalent for Numidia, his father's kingdom, which, fays Dio, had before been converted into a province. About the year of Rome 759, the Gætulians rebelled againft king Juba, maffacring all the Romans fettled in his dominions, and committing moft dreadful ravages in all the provinces fubject to him. Dio afcribes this defection to the refentment of the Gætulians, who were extremely incenfed againft the Romans for impofing a prince upon them, and not permitting them to live under the Roman government. However, Cornelius Coffus fo completely defeated them, that they were obliged to fubmit upon the terms which he thought fit to prefcribe. This was efteemed at Rome fo fignal an exploit, that triumphal honours were decreed to him, and he was allowed to affume the cognomen Gætulicus. Notwithftanding this difafter, the Gætulians recovered themfelves to fuch a degree, that in the elder Pliny's time they had fettlements in Numidia and Tingitania, as we may infer from that author and Philoftratus.

GÆTULIANS. See GETULIA, fupra.

GÆTULIANS, *Black*. See MELANOGÆTULI and NIGRITÆ.

GAFERAID, in *Geography*, a town of Afiatic Turkey, in Caramania; 32 miles S. E. of Cogni.

GAFET, in the *Materia Medica of the Arabians*, a name given by Avicenna and others to the farcocolla of the Greeks.

GAFF, in *Sea Language*, a fort of boom or pole ufed to extend the upper edge of the mizen; the foremoft or inner extremity of it is furnifhed with two cheeks, forming a femi-circle, which inclofe the after part of the maft, fo as to confine the gaff clofe to its refpective maft whilft the fail is hoifting or lowering.

GAFFS. See GABLOCKS.

GAFILE, in *Geography*, a town of Sweden, in the lapmark of Afele, on a river of the fame name; 25 miles E.S.E. of Afele.

GAFOLD-LAND, or GAFUL-*land*, *terra fenfualis*, in our *Old Writers*, land liable to taxes, and rented or let for rent.

GAFORUS, or GAFURIUS, See FRANCHINUS.

GAFSA, in *Geography*, a town of Africa, in Biledulgerid, anciently called *Capfa*, which fee.

GAG, in *Geography*, one of the iflands in the oriental Archipelago, adjoining to the main land of Papua or New Guinea, which fee.

GAGÆ, in *Ancient Geography*, a town of Afia, in Lycia.— Alfo, a river of Afia, in Lycia, which furnifhed the ftone called "Gagates." Pliny. Diofcorides.

GAGANIGURRA, in *Geography*, a town of Hindooftan, in Baramaul; five miles E. of Caveripatnam.

GAGARAWAD-BAY, a bay on the N. coaft of the ifland of St. Vincent.

GAGASMIRA, in *Ancient Geography*, a town of India, on this fide of the Ganges, (Ptolemy); fuppofed to be the modern *Agimere*, which fee.

GAGATES. See JET.

GAGATUN, in *Geography*, a town of Bengal; twenty-five miles E. of Dacca.

GAGE, in our *Ancient Cuftoms*, fignifies a pledge, or pawn, given by way of fecurity.

The word is only properly ufed in fpeaking of moveables: for immoveables, the term *hypotheca* is ufed.

If the gage perifh, the perfon who received it is not to anfwer for it, but only for extreme negligence, &c.

GAGE is alfo ufed for a challenge to combat.

In which fenfe it was a pledge, which the accufer, or challenger, caft on the ground, and the other took up, as accepting the challenge: this was ufually a glove, gantlet, chaperoon, or the like.

The Grand Cuftomary mentions *gages pleiges de duel.*

Thefe were gentlemen of the relations or friends of the combatants. If he who had given the *gages pleiges* was overcome, he was to pay a mulct agreed on.

GAGE is only now retained as a fubftantive: as a verb, the *g* is changed into *w*; and of *gage* is formed *wage*. As, to

to wage law, to wage deliverance, *q. d.* to give ſecurity a thing ſhall be delivered.

If a perſon who has diſtrained be ſued for not having delivered what he had took by diſtreſs, he ſhould wage, or gage, or gager, deliverance; that is, put in ſurety that he will deliver them.

Gage, *mort*, *mortuum vadium*, is that which is left in the hands of the proprietor, ſo that he reaps the fruits thereof: in oppoſition to *vif-gage*, *vivum vadium*, where the fruits or revenues are reaped by the creditor, and reckoned on the foot of the debt, which diminiſhes in proportion thereto. The ſecond acquits or diſcharges itſelf, and as it ſubſiſts, ſurvives the debt, and is therefore called living pledge; the firſt does not.

Pomey alſo uſes mort-gage for the poſſeſſion of any effects, on condition of ſurrendering them up at the good pleaſure of the perſon who gave them. See Mortgage.

Gage, in *Carpentry* and *Joinery*, is an inſtrument for drawing a line on one of the faces of a piece of ſtuff parallel to another, in order to reduce the ſtuff to a breadth or thickneſs.

Its chief uſe is for gaging of tenons true, to fit into mortiſes; and for gaging ſtuff of an equal thickneſs.

It is made of an oval piece of wood, fitted upon a ſquare ſtick, to ſlide up and down ſtiffly thereon, and with a tooth at the end of a ſtaff, to ſcore, to ſtrike a line upon the ſtaff at any diſtance, according to the diſtance of the oval from it.

Gage, in the *Sea Language*. When one ſhip is to windward of another, ſhe is ſaid to have the *weather gage* of her.

The ſeamen alſo call trying how much water a ſhip draws *gaging*, or rather *gauging* of her; and it is done thus: They drive a nail into a pike, near the end, and then put down this pike by the rudder, till the nail catch hold under it; for then, as many feet as the pike is under water is the ſhip's gage, or depth of water ſhe draws.

Gage, among *Letter-founders*, is a piece of box, or other hard wood, variouſly notched; which is uſed to adjuſt the dimenſions, ſlopes, &c. of the different ſorts of letters. There are ſeveral kinds of theſe gages. See Foundery.

Gage, in *Pneumatics*, is of various ſorts, according to the purpoſes to which it is applied. Thus.

Gage *of the Air-pump*. The principle upon which the gage of the air-pump is conſtructed is very obvious; we ſhall here briefly deſcribe thoſe that are in common uſe, and refer to the article Air-*pump* for the mode of their application. The "ſhort barometer gage" is merely the lower part of a barometer or a tube about eight or nine inches in length, filled with mercury, and immerſed with its aperture into a ſmall quantity of mercury contained in a glaſs-veſſel, which forms the ciſtern. This gage is either placed under the receiver upon the principal plate of the pump, or it is placed under a ſeparate ſmall receiver, upon a ſmall auxiliary plate, which is annexed to ſome air-pumps for this purpoſe. As this gage is not equal to a whole barometer, it will not ſhew the very ſmall degree of rarefaction; but its indications will commence when about three-quarters of the air have been removed from the receiver, that is, when the air has been rarefied till its remaining elaſticity is not able to ſupport that column of mercury. This gage has a ſcale of inches and parts of an inch affixed to the tube, which ſhews the preciſe altitude of the mercury in it. The "long barometer gage" is a tube of about thirty-three inches in length, open at both ends, having its lower end immerſed in a ciſtern of quickſilver, which is fixed on the pedeſtal, or lower part of the frame of the pump; the tube itſelf reaching from that place to the height of the plate. The upper aperture of the tube communicates, by means of a braſs tube, with the inſide of the pump. This is, in reality, an empty barometer, which is filled with quickſilver, by withdrawing the air from it through its upper aperture; and if the pump could produce a perfect vacuum, the mercury in this long gage would riſe as high as it does in the common barometer; but as the pump cannot exhauſt ſo far, therefore the difference of altitude between the mercury of the long gage, and that of a common barometer, ſhews the quantity of air that remains in the receiver. This difference of altitude is indicated by a ſcale of inches and parts of inches, which is always affixed to the long barometer gage. As the altitude of the mercury in a common barometer is to its cotemporaneous altitude in this gage, ſo is the whole quantity of air which was in the receiver before the rarefaction to that quantity which has been drawn out of it. The "ſyphon-gage" differs from the ſhort barometer gage merely in this circumſtance; that inſtead of terminating in a little ciſtern, in this gage the tube is bent and riſes upwards with its aperture, which by means of a braſs tube is made to communicate with the inſide of the pump; ſo that the aſcending leg of the tube performs the office of a ciſtern: hence, in rarefying the air, the mercury deſcends from the cloſed end of the tube, and riſes into the aſcending leg; and conſequently the altitude of it in one leg above its altitude in the other leg, which is in reality the ciſtern, ſhews the degree of rarefaction, and this altitude is denoted by an annexed ſcale of inches and parts of inches.

The gages above-mentioned evidently indicate the elaſticity of the fluid, which remains in the receiver of the pump after a certain degree of rarefaction; and it is immaterial whether that elaſtic fluid be air, or vapour of water, or other elaſtic fluid; but there is another gage, which from its ſhape was called the "pear-gage" by its inventor, Mr. Smeaton, and which ſhews (not at the actual time, but after the re-admiſſion of air into the receiver) how much air was left in the receiver in the preceding rarefaction. This pear-gage conſiſts of a glaſs-veſſel A (*Plate* XIV. *Pneumatics*, *fig.* 4.), which has a ſmall projecting orifice B, and at the other end it is extended into a tube cloſed at D; the capacity of this tube is the 100dth part of the capacity of the whole veſſel. This gage is ſuſpended, with its aperture downwards, to the lower end of a ſlip-wire, or a wire which paſſes through a collar of leather, within a glaſs-receiver of the pump, and exactly under it a ſmall cup, containing quickſilver, is placed upon the plate of the pump. When the pump has been worked to the intended degree, the air in the pear-gage is evidently rarefied as much as it is in the receiver. In that ſtate, by lowering the ſlip wire, the pear-gage is let down till its aperture B has reached the bottom of the mercury. This done, the external air is admitted into the receiver; but it cannot be admitted into the pear-gage, becauſe the aperture B of that gage is now immerſed in the quickſilver; but the preſſure of the atmoſphere on the ſurface of the quickſilver forces that fluid into the pear-gage, and fills it up to a certain degree E; then the upper part D E of the gage will contain all the air or vapour which occupied the whole cavity of the gage during the rarefaction. Annexed to the upper part D E of the gage is a divided ſcale, which ſhews what part of the capacity of the whole gage is filled with air, and of courſe it manifeſts the degree to which the rarefaction of the air had been carried. *E. G.* If we find that the part D E of the gage, which is filled with air above the quickſilver, is the 500dth part of the whole, we may conclude, that the air in the receiver had been rarefied 500 times, &c. But between the indications of this and of the preceding gages, there

will

will be a very confiderable difference. When the receiver contains no other fluid befides air, then the pear-gage and the other gages indicate the fame degree of rarefaction; but if the receiver contain the vapour of water or of other liquor, then the pear-gage will indicate a much greater degree of rarefaction than the other gages; becaufe the vapour which has elafticity fufficient to fupply the place of air in the receiver, on the re-admiffion of air, is condenfed into a fpace much fmaller than the fame quantity of rarefied air can be condenfed into; fo that the pear-gage fhews the quantity of air alone which had been left in the receiver; whereas the other gages fhew the quantity of elaftic fluid which is actually remaining in the receiver.

The extraordinary powers of exhauftion in Mr. Smeaton's air-pump, as they are indicated by his pear-gage, have been confidered with peculiar attention by Mr. Nairne, F.R.S. He was led to profecute a feries of experiments on this fubject, by obferving the remarkable difference between the indications of exhauftion and rarefaction by this gage, and by the common barometer-gage. Having ufed every poffible precaution in preparing his different gages, he neverthelefs found, that, when they are put under a receiver, placed on a leather dreffed in alum, and foaked in oil and tallow, according to his ufual method, and the pump was worked for ten minutes, the quickfilver in the barometer-gage rofe to within one tenth of an inch of the height of the quickfilver in the ftandard barometer, which was at that time at thirty inches, and indicated that the air had been rarefied only about three hundred times; whereas Mr. Smeaton's pear-gage indicated a degree of exhauftion equal to fix thoufand times; the whole of its cavity, on dipping its open end into the cup of quickfilver, and letting in the air, except a fix thoufandth part, being filled by the quickfilver. The difference of indications by thefe two gages was found much more confiderable in fubfequent experiments. Having an opportunity of repeating fome of thefe experiments before the honourable Henry Cavendifh, Mr. Smeaton, and others, in April 1776, Mr. Cavendifh accounted for the obferved and aftonifhing difference, by referring to fome experiments of his father, lord Charles Cavendifh, from which it appeared, that water, whenever the preffure of the atmofphere on it is diminifhed to a certain degree, is immediately turned into vapour, and reduced as fuddenly to water again on reftoring the preffure: the degree of preffure varies according to the temperature of the water; for when the heat is 72° of Fahrenheit's fcale, it turns into vapour as foon as the preffure is reduced to that of three quarters of an inch of quickfilver, or about one fortieth of the ufual preffure of the atmofphere; but when the heat is only 41°, the preffure muft be reduced to that of a quarter of an inch of quickfilver, or to one hundred and twentieth of the ufual preffure, before the water turns into vapour. According to this theory, whenever the air in the receiver is exhaufted to the above-mentioned degree, the moifture adhering to the different parts of the machine will be converted into an elaftic vapour, and fupply the place of the air, which is drawn away by the working of the pump; and the fluid left in the receiver and pear-gage will be chiefly this vapour. When the air is let into the receiver, the vapour within the pear-gage will be reduced to water, and only the real air will remain uncondenfed; and therefore this gage only fhews how much real air is left in the receiver, and not how much the preffure or fpring of the included air is diminifhed; whereas the barometer-gage fhews how much the included fluid is diminifhed, and that equally, whether it confifts of air or vapour. In order to afcertain the truth of this plaufible theory, Mr. Nairne proceeded to free every part of his apparatus as much as poffible from any adhering moifture, concluding that by this means he fhould be able to bring the two gages to an agreement. Inftead of placing the receiver on leather, as before, he put it on the pump-plate, made as clean and dry as poffible, and applied a cement round its edge to exclude the outward air. When the pump in this ftate was worked for ten minutes, the barometer-gage indicated a degree of exhauftion nearly equal to fix hundred; and, on letting the air into the receiver, the pear-gage indicated a degree of exhauftion little more than fix hundred alfo. In another experiment he put a piece of the oiled leather above mentioned in the receiver, and found, on working the pump, that the barometer-gage indicated a degree of exhauftion of nearly three hundred, but the pear-gage indicated a degree of exhauftion not lefs than four thoufand. But on taking out the piece of leather, and repeating the experiments, the two gages agreed, as before. Having thus concluded, in general, that a confiderable quantity of vapour arofe from the compound of leather, alum, oil, and tallow, it was his next object to find out from which of thefe fubftances the vapour was principally derived. For this purpofe he feparately and fucceffively included in the receiver two ounces of tallow, the fame quantity of oil and alum, and a piece of leather as it comes from the leather-fellers, weighing a hundred grains: from thefe experiments he found that the elaftic vapour, which occafioned fo great a difference in the teftimony of the gages, arofe chiefly from the leather, and very little from the tallow, oil, and alum. In the experiment with the leather, it fupplied the place of the exhaufted air fo faft, that he could not in ten minutes make the barometer-gage indicate a degree of exhauftion of more than a hundred and fifty-nine; whereas that of the pear-gage was a hundred thoufand. In order to determine whether the difference in the gages was occafioned by the moifture of the leather, Mr. Nairne repeated the experiment with a piece of frefh leather, weighing a hundred grains. The pear-gage indicated a rarefaction of a hundred thoufand, and the leather had loft two grains of its weight; when the fame piece of leather was fo thoroughly dried by the fire till it would lofe no more of its weight, and thus reduced to eighty grains, it gained two grains in the experiment, and the pear-gage exhibited a rarefaction only of two hundred and eighty. The leather was afterwards held in the fteam of hot water till it had regained its former moifture and weight, and the degree of exhauftion indicated by the pear-gage was a hundred thoufand, and the lofs of weight, two grains, as before. In the firft of thefe experiments, the degree of rarefaction indicated by the barometer-gage was a hundred and thirty-four; in the fecond, two hundred and fixty-eight; and in the third, one hundred and forty-feven. The effect of the vapour arifing from fmall quantities of different fluids, and from other fubftances containing moifture, was tried in a variety of inftances; and having found that the fmall quantity of moifture which exhaled from the fubftances under the receiver, prevented the pump from exhaufting to a confiderable degree, Mr. Nairne fufpected that whenever wet leather had been ufed to connect the receiver with the plate, there muft have arifen fo great a quantity of vapour as to have prevented the degree of exhauftion from being near fo great as in other inftances. This led him to another fet of experiments, in order to afcertain this fact. Having firft placed the receiver on the pump-plate, made clean and dry, with only a little oil poured round the outfide edge of it, both gages agreed in indicating a rarefaction of fix hundred, as before: but when the receiver was fet on leather that had been foaked for two days in water, the rarefaction indicated by the barometer-gage was

was uniformly fifty-one in three different trials; but the pear-gage exhibited firft fixteen thoufand, in the fecond inftance fifteen hundred, and in the third one thoufand: when the receiver was placed on a piece of leather, foaked in a mixture of water and fpirit of wine, the barometer-gage in three trials always indicated a degree of exhauftion equal to forty-feven; but the pear-gage was unaccountably various; in the firft trial being twelve thoufand, in the fecond, eleven hundred and fifty; and in the third, five hundred. By thefe experiments it fufficiently appears, that the ufe of leather foaked in water, or in water and fpirit of wine, prevents the pump from exhaufting to any confiderable degree. By two other experiments, in which water was ufed for foftening the leathers of the piftons of a common air-pump, we find that the higheft degree of rarefaction that could be procured was thirty-feven, according to the barometer-gage; and thirty-eight according to the pear-gage. Mr. Nairne's laft experiment furnifhes a very extraordinary evidence of the effect of vapour on the barometer-gage: having put a phial of ether under the receiver, in order to produce artificial cold, and working the pump for half an hour, the degree of exhauftion indicated by the barometer-gage was only fixteen; though the fame pump exhaufted above four hundred times before the ether was put under the receiver. The degree of cold produced by means of ether, in the exhaufted receiver, was 48°, below 0 in Fahrenheit's fcale, or 103° below 55°, which was the temperature of the air in the room where the experiment was made. Phil. Tranfact. vol. lxvii. part ii. art. 32, page 614, &c.

GAGE *of the Barometer*, is a contrivance for eftimating the exact degree of the rife and fall of the mercury in the Torricellian tube. It is well known, that whilft the mercury rifes in the tube, it finks in the ciftern, and *vice verfâ*; and, as the diftance between the divifions graduated on the annexed fcale and the furface of the mercury in the ciftern is not truly fhewn by the numbers on the fcale, errors muft happen in determining the precife height of the mercury. To remedy this inconvenience, a line is cut upon a round piece of ivory, which is fixed near the ciftern: this line is accurately placed at a given diftance from the fcale; *e. gr.* twenty-feven inches; and a fmall float of cork, with a cylindric piece of ivory fixed to its upper furface, on which a line muft be cut at the diftance of two inches, exactly from the under furface of the cork, is left to play freely on the quickfilver, and the cylinder works in a groove made in the other piece: from this conftruction it appears, that if thefe marks are made to coincide, by raifing or lowering the fcrew which acts on the quickfilver, then the divifions on the fcale will exprefs the true meafure of the diftance from the furface.

GAGE *of the Condenfer*, is a glafs tube of a particular conftruction, adapted to the condenfing engine, and defigned to fhew the exact denfity and quantity of the air contained at any time in the *condenfer*, which fee. For this purpofe, let *D d e f c*, *Plate* XIV. *Pneumatics*, *fig.* 5. be a fmall glafs tube, about one-tenth of an inch in diameter, open at D, but hermetically fealed at *c*; D E a larger tube, hermetically fealed at D, and containing at that end a quantity of mercury, which takes up two or three inches in length, and covers the open end of the fmaller tube; the other end C, of the larger tube, is ftrongly cemented into the brafs elbow-piece O E *o* at C, *fig.* 6, fo as not to be quite at right angles with O *o*, but to incline a little downwards, that the mercury at D may not run towards C, and pafs into the condenfing glafs G B. This gage is fcrewed on at *o*, and the injecting fyringe at O, a cock being interpofed at O or *o*, or not ufed at all, according to the nature of the experiment. Whilft air is injected into the condenfing glafs, and the large tube of the gage at the fame time, the air in the fmaller tube, which has no communication with the injected air, muft be rarer and weaker, and, therefore, the mercury at D will enter the tube, and advance in it, in proportion to the condenfation of the air in G B. In *fig.* 5, *d*, *e*, *f*, reprefent three rings of fpringy wire, at fuch diftances as to fhew, by the motion of the mercury in the fmall tube, when the denfity of the air is doubled, tripled, or quadrupled; becaufe the air, which at firft filled the whole fmall tube, now takes up only the fpaces *c d*, *c e*, *c f*; or, in Mr. Hawkfbee's ftyle, one, two, or three atmofpheres are thrown in.

Another kind of gage may be put within the condenfing glafs, at the bottom of it, when the ufe of the preceding gage would be inconvenient. This is a fhort cylinder of wood, *fig.* 7, about an inch thick, with a hole through its middle between *a* and *b*, of about 1½ inch in diameter; the outward diameter of the cylinder muft be about four inches, fo that the cylinder may eafily ftand within the condenfing glafs on the plate, fupporting its bottom at B, *fig.* 6. There is a hole at A of about ¾ of an inch in diameter, and ¾ of an inch deep, filled with mercury; *a c d b* is a fmall glafs tube, open at *a*, but hermetically fealed at *b*, and bent to a right angle at *c*, the middle of the diftance between *a* and *b*. When the open end, *a*, is immerfed in mercury, and the air on the furface of the mercury condenfed, the air in the tube will recede towards the elbow *c*, and the mercury following it, fhew to what degree it is condenfed. When the mercury is at *c*, then one additional atmofphere bears upon its furface, and two atmofpheres, if it be come to *d*; which places are marked by rings of fpringing brafs wire; at *a* and *b*, about an inch of the ends of the tube are bent to a right angle, that the end *b* may go into the wood, whilft the end *a* goes under the furface of the mercury, where it is held by a cork, whilft air is injected into the condenfing glafs. Defaguliers' Exp. Phil. vol. ii. p. 394, &c.

GAGE, *Sea*. See ALTITUDE.

GAGE, *Bucket Sea*, an inftrument contrived by Dr. Hales, to find the different degrees of coolnefs and faltnefs of the fea, at different depths: it confifts of a common houfhold pail or bucket, with two heads. Thefe heads have each a round hole in the middle, about four inches in diameter, covered with fquare valves opening upward; and that they may both open and fhut together, there is a fmall iron rod fixed to the upper part of the lower valve, and the other end to the lower fide of the upper valve. So that as the bucket defcends with its finking weight into the fea, both the valves may open by the force of the water, which by that means has a free paffage through the bucket. But when the bucket is drawn up, then both the valves fhut by the force of the water at the upper part of the bucket; fo that the bucket is drawn up full of the loweft fea water to which it has defcended.

When the bucket is drawn up, the mercurial thermometer fixed in it is examined; but great care muft be taken to obferve the degree at which the mercury ftands, before the lower part of the thermometer is taken out of the water in the bucket, left it be affected by the different temperature of the air.

In order to keep the bucket in a right pofition, there are four cords fixed to it, reaching about three feet below it; to which the finking weight is fixed.

The refult of feveral trials with this gage was, that when it was let down to different depths, from 360 feet to 5346 feet, in lat. 25° 13′ N. and long. 25° 12′ W., it was difcovered by the thermometer, that the cold increafed gradually in proportion to the depths, till it defcended to 3900 feet, *viz.*

 near

near $\frac{3}{4}$ of a mile, whence the mercury in the thermometer came up at 53; and though it was afterwards funk to 5346 feet, *i. e.* a mile and 66 feet, it came up no lower: the warmth of the water upon the furface, and that of the air, was all that time 84°.

When the water in the bucket was become of the fame temperature with that on the furface of the fea, equal quantities of both were weighed and tried by the hydrometer: that from below was found to be the heavieft, and, confequently, the faltеft. See Treatife on Ventilators, part ii. p. 122, &c.

Dr. Hales was probably led to the conftruction of this fea-gage from an inftrument invented by Dr. Hook, and defigned for the fame purpofe. This confifts of a fquare wooden bucket C, *Plate* XVI. *Mifcellany*, *fig.* 1, whofe bottoms are fo contrived, that, as the weight A finks the iron B, to which the bucket C is faftened by two handles D, D, on the end of which are the moveable bottoms or valves E, E, and thereby draws down the bucket, the refiftance of the water keeps up the bucket in the pofture C, whereby the water, whilft the bucket is defcending, hath free paffage through it; whereas, as foon as the bucket is pulled upwards by the line F, the refiftance of the water to that motion bears the bucket downwards, and keeps it in the pofture G, whereby the included water is kept from getting out, and the ambient water kept from getting in. Phil. Tranf. N° 9, p. 149, and No. 24, p. 447, or abr. vol. ii. p. 260.

Gage, *Aqueo-mercurial*, is the name of an apparatus contrived by Dr. Hales, and applied, in various forms, to the branches of trees, in order to determine the force with which they imbibe moifture. Let *e r*, *Plate* XVI. *Mifcellany*, *fig.* 2. be a cylindric glafs, *e. gr.* of an inch diameter within, and eight inches long. Into this glafs is introduced the branch of a young thriving apple-tree *b*, about three feet long, with lateral branches; the diameter of the tranfverfe cut *i* being $\frac{3}{4}$ of an inch. Having fitted the joint *r* to the tube at *r*, by folding a piece of fheep's fkin round the ftem, it is cemented with a mixture of bees'-wax and turpentine melted together in fuch a proportion, as to make a very ftiff clammy pafte when cold, and over the cement folds of wet bladders are bound firmly with packthread. To the lower end *e* of the large tube, a fmaller tube *z e* is cemented, being about $\frac{1}{4}$ of an inch diameter, and eighteen inches long, and in fubftance full $\frac{1}{8}$ of an inch thick. Thefe tubes are cemented together at *e* with common hard brick-duft, or powdered chalk cement, and the joint is farther fecured with the cement of bees'-wax and turpentine, over which a wet bladder is bound. The apparatus being thus prepared, the branch is turned downwards, and the glafs tube upwards, and then both tubes are filled with water, with the finger applied to the open end of the fmall tube, it is inverted and immerfed in the glafs ciftern *x*, full of mercury and water. In this fituation the lower end of the branch was immerfed fix inches in water, *viz.* from *r* to *i*; the water was imbibed by the branch at its tranfverfe cut *i*; and during its afcent into the fap veffels of the branch, the mercury rofe in the tube *e z* from the ciftern *x*, fo that in half an hour it was rifen $5\frac{3}{4}$ inches high, as far as *z*. The height of the mercury indicated, in fome meafure, the force with which the fap was imbibed, though not the whole force; becaufe, while the water was imbibed by the branch, its tranfverfe cut was covered with innumerable little hemifpheres of air, and many air-bubbles iffued out of the fap-veffels, which partly filled the tube *e r*, as the water was drawn out of it: and, therefore, the height of the mercury could only be proportional to the excefs of the quantity of water drawn off above the quantity of the air, which iffued out of the wood. If the quantity of air, iffuing from the wood, had been equal to the quantity of water imbibed, it is plain that the mercury could not rife at all, becaufe there would be no room for it in the tube: but if nine parts in twelve of the water be imbibed by the branch, and only three fuch parts of air iffue into the tube in the fame time, the mercury muft rife near fix inches, and fo proportionably in other cafes. Dr. Hales obferved, that the mercury rofe higheft, in moft cafes, when the fun was clear and warm, and that it fubfided three or four inches towards evening, but rofe again the next day as it grew warm, though feldom fo high as at firft. Dr. Hales adapted the fize and fhape of the glafs apparatus to a great variety of branches of feveral fizes, and of different kinds of trees, and repeated the experiment above defcribed, *mutatis mutandis*, in a variety of inftances. See his Vegetable Statics, vol. i. chap. ii. p. 84, &c.

Gage, *Sliding*, is a tool ufed by mathematical inftrument makers for meafuring and fetting off diftances: it confifts of a beam, tooth, fliding focket, and the fhoulder of the focket.

Gage, *Tide*, is the name of an inftrument ufed for determining the height of the tides by Mr. Bayly, in the courfe of a voyage towards the fouth-pole, &c., in the Refolution and Adventure, in 1772, 1773, 1774, and 1775.

This inftrument confifts of a glafs tube, whofe internal diameter was feven-tenths of an inch, lafhed faft to a ten feet fir rod, divided into feet, inches, and quarters: this rod was faftened to a ftrong poft fixed upright and firm in the water. At the lower end of the tube was an exceeding fmall aperture, through which the water was admitted. In confequence of this conftruction, the furface of the water in the tube was fo little affected by the agitation of the fea, that its height was not altered one-tenth of an inch when the fwell of the fea was two feet; and Mr. Bayly was certain, that with this inftrument he could difcern a difference of one-tenth of an inch in the height of the tide.

Gage, *Water*. See Altitude and Hydrometer.

Gage, *Weather*, in *Sea Language*. See Gage, above.

Gage *Ifland*, in *Geography*, an ifland in Upper Canada, in the county of Ontario, lying off Kingfton in lake Ontario, between Amherft ifland and Wolfe ifland.

Gage's *Town*, a fettlement in Sunbury county, New Brunfwick, on the lands amounting to 20,000 acres, on the weft fide of John's river on the northern fhore of the bay of Fundy.

GAGER *de Ley*. See Wager *of law*.

Gager, *and* GAGING, in *Geometry*. See Gauger. Gauging.

GAGES, in *Geography*, a town of France, in the department of the Aveiron; fix miles N. E. of Rhodez.

GAGLIARDA, *Ital.* Gaillarde, *Fr.* a gay, frolicfome, and riotous old dance; which, like the modern *waltz*, is almoft always in triple time. Galliarda, *quafi* valiarda, from the Latin *validus*, ftrong, ftout, powerful, brifk, lively.

This dance has been long out of ufe; but there was a time when the galliarda was a favourite movement, not only with dancers, but with performers on the virginal: as in queen Elizabeth's Virginal book, in that of lady Nevil, and in Parthenia, the galliarda generally ferves as an allegro to Pavana, a flow and ftately dance, in almoft every fuit of leffons in the three collections by Dr. Bull, Bird, Giles Farnabie, Morley, and others. See Pavana and Parthenia.

GAGNANO, in *Geography*, a town of Naples, in Capitanata; 17 miles E. of Lefina.

GAGNEF, a town of Sweden, in Dalecarlia; 15 miles S. W. of Fahlun.

GAGNIER, John, in *Biography*, born and educated at Paris, was a diligent ſtudent in the Hebrew and Arabic languages, in which he became a great adept. He was brought up in the Catholic faith, and when his ſentiments changed in this reſpect, he left France and came to England, where he ſoon acquired the friendſhip of many able and very learned men, among whom were archbiſhop Sharp, and the lord chancellor Macclesfield. He graduated at Cambridge, and likewiſe at Oxford, where he fixed his reſidence for the ſake of conſulting the Bodleian library, and he ſupported himſelf by teaching Hebrew. He publiſhed, in 1706, Joſeph Ben Gorion's Hiſtory of the Jews, in the original Hebrew, with a Latin tranſlation and notes, in a quarto volume. In 1717 he was appointed to read the Arabic lecture at Oxford in the abſence of Dr. Wallis, and upon his death was choſen to the profeſſorſhip in his ſtead, which office he filled with great reputation till his death. He publiſhed two valuable works reſpecting the hiſtory of Mahomet: theſe are, "Iſmael Abulfeda de vita et rebus geſtis Mohammedis, &c. Latine vertit, Prefatione et notis illuſtravit Joh. Gagnier:" and "La Vie de Mahomet, traduite et compilèe de l'Alcoran, des Traditions authentiques de la Sonna, et des meilleurs Auteurs Arabes," 3 vols. 12mo.

GAGNOLA, in *Ichthyology*, a name given by the Spaniards to a ſpecies of the acus, or ſyngnathus of Artedi. The particular ſpecies meant by it, is that called by Artedi the hexagonal bodied ſyngnathus with the pinnated tail; others call it the acus Ariſtotelis, or acus ſecunda, and the French the trompette; we call it ſometimes the needle-fiſh, ſometimes the trumpet-fiſh, and ſometimes the tobacco-pipe fiſh. See Syngnathus.

GAGO, in *Geography*, a kingdom of Africa, with a town of the ſame name, in Negroland; fertile and abounding in corn, rice, and mines of gold. N. lat. 12°. E. long. 2°.

GAGRA, a river of Hindooſtan, which riſes in the lofty weſtern mountains of Thibet, and after a courſe of between 600 and 700 miles, nearly parallel on the eaſt with that of the Ganges, pervading the province of Oude, flows into the Ganges near Chupra: it is now called Surjoo.

GAGUIMPAR, a town of Hindooſtan, in Golconda; 15 miles W. S. W. of Hydrabad.

GAGUIN, Robert, in *Biography*, was born at Colines, in the dioceſe of Amiens. He ſtudied at Paris, took the degree of doctor of laws, and was ſoon after made profeſſor of canon law. In 1473, he was elected general of the order of the Mathurins, and on account of his reputation was employed by Charles VIII. and Louis XII. in various embaſſies in Italy, Germany, and England. He died at Paris in the year 1501. He was conſidered one of the beſt Latin writers of his age, yet his ſtyle is defective in purity and elegance. He was author of many works: of theſe the principal are, 1. "Compendium ſuper Francorum geſtis Pharamundo uſque ad annum 1491." 2. "The Chronicle of Archbiſhop Turpin, tranſlated from Latin into French by command of Charles VIII." 3. "Epiſtolæ et Orationes." 4. "De Puritate Conceptionis Virginis Mariæ." He is ſaid to have given a French tranſlation of Cæſar's Commentaries. Moreri.

GAGUL, in *Geography*, a river of Beſſarabia, which runs into the Danube; eight miles E. of Reni.

GAHALA, in *Botany*, a name given by ſome writers to the *colocaſia*, or great Egyptian arum.

GAHARAN, in *Geography*, a town of Algiers; 60 miles W. S. W. of Tubnah.

GAHNIA, in *Botany*, named by Forſter in honour of Dr. Henry Gahn, a Swediſh botaniſt, whoſe inaugural diſſertation is in the *Fundamenta Agroſtographiæ* of Linnæus. Forſt. Gen. t. 26. Linn. Suppl. 21. Schreb. 235. Willd. Sp. Pl. v. 2. 244. Juſſ. 27. Brown Nov. Holl. v. 1. 238. Lam. Illuſtr. t. 263. Gærtn. fil. t. 181. Claſs and order, *Hexandria Monogynia*. Nat. Ord. *Calamariæ*, Linn. *Cyperoideæ*, Juſſ.

Gen. Ch. *Cal.* Glumes numerous, imbricated on all ſides, channelled, pointed, the upper, or innermoſt, largeſt, permanent. *Cor.* none. *Nectary*, or briſtles about the baſe of the germen, none. *Stam.* Filaments ſix, rarely but three, capillary, ſhort, greatly elongated after flowering, and permanent; anthers linear, pointed. *Piſt.* Germen oblong; ſtyle thread-ſhaped, erect, longer than the calyx, three-cleft; ſtigmas two to each diviſion, capillary, recurved, rarely ſimple. *Peric.* Nut bony, oblong, angular, ſmooth, encompaſſed with the permanent filaments. *Seed* ſolitary, tranſverſely notched.

Eſſ. Ch. Calyx of numerous imbricated glumes. Filaments elongated after flowering. Style three-cleft. Nut with a ſolitary tranſverſely notched ſeed.

Obſ. We have profited by the remarks of Mr. R. Brown and of Gærtner, aſſiſted by our own examination of the plants of this genus, to render its character more faithful. The corolla and nectary of Linnæus are probably interior more delicate ſcales, found in the flowers of ſome ſpecies, but we ſuſpect not in all. The flowers are truly ſimple and diſtinct, each reſembling a ſpikelet, but conſiſting of a rachis or receptacle clothed with imbricated ſcales and crowned with the organs of impregnation.

1. G. *procera*. Linn. Suppl. 211. Forſt. Prod. 25. Nov. Act. Upſ. v. 3. 178. Panicles ſpicate, numerous, elongated. Nut priſmatic, oblong. - Native of New Zealand, near Duſky Bay. A hard, rigid, ruſhy plant, three or four feet high. *Leaves* narrow, channelled, rough. *Panicles* ſlender, aggregate, leafy, with blackiſh, broad, long-pointed bracteas, extending beyond the flowers. *Nut* light brown, priſmatic, equally tapering at both ends. *Stigmas* deeply divided, The long, brown, permanent filaments are very remarkable.

2. G. *ſchœnoides*. Forſt. Prod. 26.—Culm zig-zag. Panicles compound, ſpicate, crowded. Nut obovate, obtuſe; priſmatic at the baſe. — Native of Otaheite. *Panicles* more denſe and crowded than in the former, with broader bracteas. The broader blunt fruit at once diſtinguiſhes it. Mr. Brown refers this ſpecies to his new genus *Lampocarya*, in which the ſeed is not tranſverſely notched.

3. G. *pſittacorum*. Billard. Nov. Holl. v. 1. 89. t. 115. Brown. Nov. Holl. v. 1. 238. — Panicle repeatedly compound. Nut nearly globular. Glumes obtuſe. Permanent filaments criſped.—Native of Van Diemen's Land. The *leaves* of this are externally remarkably rough. The large, cloſe, repeatedly branched, black panicle, and ſhining brown fruit, reſemble ſome of the large tropical ſpecies of *Holcus* or *Andropogon*. The *flowers* are very taper at their baſe, with numerous, gradually leſſening, ſcales.

4. G. *leucocarpa*. Brown 239. — "Panicle repeatedly compound. Glumes bluntiſh. Nuts opaque, with an acute withered point." — Native of the ſouth coaſt of New Holland. *Brown*. Of this we have ſeen no ſpecimens.

5. G. *erythrocarpa*. Brown 239. — Panicle repeatedly compound. Glumes all acute. Nuts nearly elliptical, ſhining, and coloured.—Native of New South Wales, about Port Jackſon and Botany Bay. *Herb. Banks.* — Like the third ſpecies, but more ſtriking and beautiful on account of its

its scarlet *fruit*, which is scarcely half so large as in that, and not obovate, but elliptical, inclining to globose.

6. G. *melanocarpa* Brown 239.—Panicles spicate, numerous. Glumes all acute. Nuts broadly elliptical, pointed, polished. Stamens three. Stigmas undivided.—Native of New South Wales and Van Diemen's Land. The *panicle* has the habit of the two first species, but is smaller and paler. The *fruit* is shining and very black. *Leaves* smooth at the back. According to Mr. Brown, who has examined the living flowers, their stamens are but three, and the stigmas are simple, yet there can be no doubt respecting the genus.

7. G. *trifida*. Billard. Nov. Holl. v. 1 89. t. 116. (Lampocarya? hexandra; Brown Nov. Holl. v. 1. 238.) Panicles dense, capitate. Glumes all pointed. Nuts nearly globular, polished. Stigmas undivided.—Native of Van Diemen's Land. Remarkable for the capitate *panicles*. The *fruit* is said to be blueish.

GAHNITE, in *Mineralogy*, one of the recently discovered Swedish fossils, of which Messrs. Eckeberg and Vauquelin have given the analyses. It is found massive and in small and middle-sized octohedral crystals, imbedded in a talcose rock. The colour is described as greenish-black, greenish-brown, and perfect liver-brown in the imperfect specimens we have had an opportunity of examining; nor were we able to discover a metallic lustre as mentioned by Haüy. Internally it is dull. Fracture imperfectly conchoidal. Hardness sufficiently great to scratch quartz. It is infusible before the blow-pipe, except here and there on the surface of small fragments, which becomes cracked and white. It does not act on the magnetic needle. Specific gravity, according to Haüy, 4.6969. The constituent parts of gahnite are thus stated:

Eckeberg.	
Alumine	60
Silica	4
Oxyd of zinc	24
Iron	9
Loss	3
	100

Vauquelin.	
Alumine	42
Silica	4
Oxyd of zinc	28
Sulphur	17
Oxyd of iron	5
Parts not acted on	4
	100

The quantity of this substance operated on by Vauquelin was not sufficient to allow him to vary his experiments. He conjectures that the zinc exists in it in the state of blende, and thinks it probable that the alumine and silica are united with this sulphuret of zinc.

Haüy refers this substance, with a query, to his spinelle, as spinelle zincifere; while Brongmart adds it to the zinc genus, under the name of zinc gahnite. The advantage of giving to new mineral substances names unconnected with theory and system, is illustrated by the instance of gahnite. While the latter name may be retained, whatever be the place this substance is to occupy hereafter in the system, one at least of the just mentioned denominations of the French mineralogists must contribute to swell its synonomy, which, considering the recency of the discovery of this fossil, is already sufficiently enriched by the proposed appellations of fahlun-crystals, fahlunite, automalite, and zinciferous corundum, which last, by the editor of a French journal, has been converted into corindon sanguifere.

GAJA, in *Geography*, a town of Italy, in the department of the Panaro; 20 miles S. of Modena.

GAIANITES, Gaianitæ, a sect of ancient heretics, sprung from the Eutychians.

This sect was of an older standing than Gaian, a bishop of Alexandria in the sixth century, from whom, however, they took their name. They adhered to the opinion of Julian Halicarnasseus, the chief of the Incorruptibles and Phantastici; and came, at length, to be denominated Gaianites, upon Gaian's putting himself at their head. They denied that Jesus Christ, after the hypostatical union, was subject to any of the infirmities of human nature.

GAJARA, in *Geography*, a town of Hindoostan, in the circar of Gohud; 12 miles N. of Narwa.

GAICKEN, a town of Prussia, in the palatinate of Culm; five miles N. E. of Strasburg.

GAIDEROPSARUS, in *Ichthyology*, a name given by some to a fish of the truttaceous kind, caught in the Mediterranean, and more usually called *callarias*.

GAIDRONISI, or Gaitheronesi, *i. e. Asses' island*, in *Geography*, a small island in the Mediterranean, near the south coast of Candia; a mere rock, producing only a few branches of thyme, and inhabited only by wild pigeons. It was fortified by Patroclus, and once bore his name, when he was deputed by the Egyptians to assist the Athenians against Antigonus, the son of Demetrius. N. lat. 34° 48'. E. long. 25° 45'.

GAJERAM, a town of Hindoostan, in the circar of Rajamandry; 15 miles N. W. of Rajamandry.

GAIGNY, or Gagny, John, in *Biography*, was probably born at Paris in the beginning of the 16th century, for in the year 1526 he had taken the degree of bachelor, and held the appointment of *procureur*, or attorney for the French nation in the university. He was afterwards lecturer in theology at the college of Navarre and rector of the university. In 1531 he took his degree as doctor of divinity, and filled the post of chancellor of the university from the year 1546 till the close of 1549, when he died. Gaigny was deeply read in the ancient languages, and highly esteemed as a Latin poet; his sovereign, Francis I., entertained so great a regard for him, that he frequently consulted him on subjects of literature, and made him his first almoner. He was author of many works, all of which were more or less connected with theology. Of these, the most important consist of "Commentaries" upon the different books of the New Testament, in which he explains the literal sense by a kind of paraphrase. He is applauded by Dupin on account of his deep learning and solid judgment, who, speaking of his writings, says, "his notes will be found of admirable use to those who desire to read the text of the New Testament, and to comprehend the sense of it without stopping at any difficult places, and without having recourse to larger commentaries." His Scholia on the four evangelists and on the Acts of the Apostles, are inserted in the Biblia Magna of Father John de la Haye. Moreri.

GAILDORF, or Gailendorf, in *Geography*, a town of Germany, in the lordship of Limburg, on the Kocher; 38 miles W.S.W. of Anspach. N. lat. 49°. E. long. 9° 54'.

GAILLAC, a town of France, and principal place of a district in the department of the Tarn, situated on the Tarn, which is here navigable; 27 miles N.E. of Toulouse. The place, which has considerable trade, and furnishes from its environs good wine, contains 6,465, and the canton 13,364 inhabitants, on a territory of 217½ kiliometres, in 11 communes. N. lat. 43° 53'. E. long. 1° 58'.

GAILLON, a town of France, in the department of the Eure, and chief place of a canton in the district of Louviers;

viers; 7 miles S.E. of Louviers. The place contains 980, and the canton 11,966 inhabitants, on a territory of 195 kiliometres, in 35 communes.

GAILNAU, a town of Franconia; 5 miles S. of Rothenburg.

GAILOVSKI, a fortrefs of Ruffia, in the government of Caucafus, on the Ural; 12 miles N.E. of Uralfk.

GAIMERSHEIM, a town of Germany, in Upper Bavaria; 2 miles N.W. of Ingolftadt.

GAIN, the profit, or lucre, a perfon reaps from his trade, employment, or induftry.

Some derive the word from the German *gewin;* whereof the Italians had made *guadagno;* the French and Englifh *gain.*

There are legal and reputable gains, as well as fordid and infamous ones. What is gained beyond a certain fum, by gaming, is all liable to be reftored again, if the lofer will take the benefit of the law.

GAIN, in *Carpentry*, the floping part of the fhoulder of a tenon, which has an additional fupport below, projecting as far as the bottom of the floping part, in order to ftrengthen the tenon.

To GAIN *the wind*, in *Sea Language*, is to arrive on the weather-fide, or to windward of fome other veffel in fight, when both are plying to windward, or failing as near the wind as poffible.

GAINAGE, GAINAGIUM, in our *Ancient Writers*, fignifies the draught-oxen, horfes, wain, plough, and furniture, for carrying on the work of tillage by the bafer fort of fokemen and villains.

Gainage is the fame with what is otherwife called *wainage.* Bracton, lib. i. cap. 9. fpeaking of lords and fervants, fays, "Ut fi eos deftruant, quod falvum non poffit eis effe wainagium fuum." And again, lib. iii. tract. 2. cap. 1. "Villanus non amerciabitur, nifi falvo wainagio fuo." For anciently, as it appears both by Mag. Chart. and other books, the villain, when amerced, had his gainage, or wainage, free; to the end his plough might not ftand ftill; and the law, for the fame reafon, does ftill allow a like privilege to the hufbandman; that is, his draught-horfes are not, in many cafes, diftrainable.

GAINAGE is alfo ufed for the land itfelf, or the profit raifed by cultivating it.

GAINAS, in *Biography*, a foldier under the eaftern emperors, who was, on account of his valour, raifed by Theodofius to the command of all the Goths and other barbarians in his fervice. He attached himfelf to Stilicho, and was employed by him in the maffacre of the prefect Rufinus: Gainas gave the fignal of death, and a daring foldier plunged his fword into the breaft of the guilty prefect, who fell, groaned, and died at the feet of the affrighted emperor. As a reward of this deed, he was created by Eutropius a general of the Roman army, but diffatisfied with his fituation, and difdaining to fubmit to the orders of a bafe eunuch, he is fuppofed to have fomented the revolt of his countryman Tribigild, with whom he was connected by a domeftic, as well as by a national alliance. He took the command againft the rebel, but was fecretly inclined to favour his caufe, and in a few months openly united his forces to thofe of Tribigild, and after plundering feveral provinces, advanced to Conftantinople, and Arcadius the emperor refigned his authority and his perfon into the hands, and upon the faith of the barbarians. The church of Euphemia was felected as the place of the interview. Gainas bowed with reverence at the feet of the emperor, but demanded the facrifice of his minifters Aurelianus and Saturninus, and when the axe was lifted up over their bare necks, he declared himfelf contented to commute the capital part of the punifhment into perpetual exile. In his early youth Gainas had paffed the Danube as a fuppliant and fugitive: his elevation had been the work of valour and fortune, and his indifcreet or perfidious conduct was the caufe of his downfall. He claimed for himfelf and his Arian followers the poffeffion of a peculiar church, but the public toleration of herefy wounded the pride of the catholics: every quarter of Conftantinople was filled with tumult and diforder. The barbarians gazed with fuch ardour on the rich fhops of the jewellers, and the tables of the bankers, which were covered with filver and gold, that it was judged prudent to remove thofe dangerous temptations from their fight. They refented the injurious precaution, and attempted to attack and deftroy with fire the imperial palace: in the tumult feven thoufand of the Goths perifhed, Gainas was declared a public enemy; and in a fhort time afterwards he, and the greater part of his followers, were flain in a battle with the king of the Huns. Univer. Hift. Gibbon, vol. v.

GAINBATESA, in *Geography*, a town of Naples, in the county of Molife; 18 miles E.S.E. of Molife.

GAINING *of a Mine*, or "putting down the foundation," are terms for the finking of fhafts, and, by means of engines or foughs, laying the vein or ftratum dry which is intended to be wrought. See MINING.

GAINING *of Land from the Sea*, is a term for excluding the tide from a tract of flat land on the fea-fhore by means of artificial banks, and conftructing the neceffary drains and fluices for venting the fpring or foakage, and the rain waters of fuch tract, into the fea at low water, or lifting the fame by means of fen-mills, engines, &c. (See EMBANKMENT.) By ftudying attentively the form in which the tides and waves throw up and maintain banks of fand and fhingle between low and high-water mark, on the Norfolk coaft, north of Yarmouth, Mr. William Smith the engineer, a few years ago, fucceeded in imitating fuch banks by art withoutfide of the principal fea-walls or mounds, and which outer or break-water banks, though compofed only of fand and fhingle, in the proper fhape and direction, which is fomewhat oblique to the line of coaft, remain and operate effectually in breaking the force of the waves and protecting the fea-walls from the ravages which they had previoufly experienced on the occurrence of certain winds with the fpring tides. The Board of Agriculture, and the Society of Arts, annually offer premiums for gaining land from the fea, and from their communications and tranfactions much valuable information is to be gathered.

The gaining of land from the fea is fometimes effected by the operations of nature, with very little or no affiftance from art, as has happened in the neighbourhood of Old Romney, in Kent, and near Sandwich in the fame county, and numerous other places: while in other, and more numerous inftances, land is progreffively loft by the undermining and wafhing away of matters compofing the cliffs. (See ENCROACHMENT *of the Sea.*) M. De Sauffure, in the fifth chapter of his Agenda, or obfervations to be made, as the foundation of a theory of the earth, inferted in N 20 of the "Journal des Mines," has enumerated fome of the principal obfervations to be made relative to the gaining or lofs of land on the coafts of the ocean, in different countries: a tranflation of which will be found in the Philofophical Magazine, vol. iii. p. 40; which obfervations, if multiplied, would prove of important ufe in geological inveftigations. In M. de Luc's Geological Travels, vol. i. pages 350. 393, &c. lately publifhed, are fome curious particulars on this fubject.

GAINSBOROUGH, THOMAS, in *Biography*, a

 painter

painter endowed with very extraordinary talents, which he exercifed in landfcapes and in portraits, to the honour of the country and age in which he lived. He was born in 1727 at Sudbury in Suffolk, and at a very early age difcovered his propenfity to painting. Nature was his teacher, and the woods of Suffolk his academy. There he would pafs in folitude his mornings, in making fketches of an antiquated tree; a marfhy brook; a few cattle; a fhepherd and his flock, or any other objects which accidentally prefented themfelves. Before he was twelve years old he had painted many pictures; and about that time went to London, where he foon found it neceffary to try what effect he could produce in portraiture. In this alfo he was fuccefsful; and acquired very confiderable practice and reputation; enjoying great favour with the public for many years.

His ftyle of execution, as well as choice of fubjects, was original, although confiderably refembling that of Watteau, more particularly in his landfcapes. His pictures are generally wrought in a loofe and flight manner, with great freedom of hand, and ufing very little colour, with a great body of vehicle; which gives to his works great lightnefs and loofenefs of effect; properties extremely valuable in a picture, and too eafily loft in the endeavour to give more ftrict and pofitive refemblance of fubftance. Sir Jofhua Reynolds in his fourteenth lecture fays of this hatching manner of Gainfborough, that his portraits were often little more than what generally attends a dead colour as to finifhing or determining the form of the features; but as he was always attentive to the general effect, or whole together, I have often imagined (fays he) that this unfinifhed manner contributed even to that ftriking refemblance for which his portraits are fo remarkable. At the fame time it muft be acknowledged that there is one evil attending this mode; that if the portrait were feen previoufly to any knowledge of the original, different perfons would form different ideas; and all would be difappointed at not finding the original correfpond with their own conceptions, under the great latitude which indiftinctnefs gives to the imagination, to affume almoft what character or form it pleafes."—" To fhew the difficulty of uniting folidity with lightnefs of manner we may produce a picture of Rubens in the church of St. Judule at Bruffels as an example; the fubject is Chrift's charge to Peter: which, as it is the higheft and fmootheft finifhed picture I remember to have feen of that mafter, fo it is by far the heavieft."—" A lightnefs of effect produced by colour, and that produced by facility of handling, are generally united. A copy may preferve fomething of the one, it is true; but hardly ever of the other."—" Gainfborough poffeffed this quality of lightnefs of manner and effect, I think, to an unexampled degree of excellence; but it muft be remembered at the fame time that the facrifice which he made to this ornament of our art was too great; it was in reality preferring the leffer excellencies to the greater."

In the fame lecture, which principally treats of the acquirements of Gainfborough and which was delivered at the Royal Academy foon after his death, by its truly exalted prefident, it is faid of him, " that if ever this nation fhould produce genius fufficient to acquire to us the honourable diftinction of an Englifh fchool, the name of Gainfborough will be tranfmitted to pofterity in the hiftory of the art among the firft of that rifing name."—" Whether he moft excelled in portraits, landfcapes, or fancy pictures, it is difficult to determine: whether his portraits were moft admirable for exact truth of refemblance, or his landfcapes for a portrait-like reprefentation of nature, fuch as we fee in the works of Rubens, Ryfdael, or others of thefe fchools. In his fancy pictures, when he had fixed upon his object of imitation, whether it was the mean and vulgar form of a wood-cutter, or a child of an interefting character, as he did not attempt to raife the one, fo neither did he lofe any of the natural grace and elegance of the other; fuch a grace and fuch an elegance as are more frequently found in cottages than in courts. This excellence was his own, the refult of his particular obfervation and tafte. For this he was certainly not indebted to any fchool; for his grace was not academical, or antique, but felected by himfelf from the great fchool of nature; where there are yet a thoufand modes of grace unfelected, but which lie open in the multiplied fcenes and figures of life, to be brought out by fkilful and faithful obfervers.

" Upon the whole we may juftly fay, that whatever he attempted he carried to a high degree of excellence. It is to the credit of his good fenfe and judgment that he never did attempt that ftyle of hiftorical painting for which his previous ftudies had made no preparation."

Nothing could have enabled Gainfborough to reach fo elevated a point in the art of painting without the moft ardent love for it. Indeed his whole mind appears to have been devoted to it, even to his dying day; and then his principal regret feemed to be, that he was leaving his art, when, as he faid, " he faw his deficiencies, and had endeavoured to remedy them in his laft works." Various circumftances in his life exhibited him as referring every thing to it. " He was continually remarking to thofe who happened to be about him, whatever peculiarity of countenance, whatever accidental combination of figures, or happy effects of light and fhadow occurred in profpects, in the fky, in walking the ftreets, or in company. If in his walks he found a character that he liked, and whofe attendance was to be obtained, he ordered him to his houfe: and from the fields he brought into his painting-room ftumps of trees, weeds, and animals of various kinds; and defigned them not from memory, but immediately from the objects. He even framed a kind of model of landfcapes on his table compofed of broken ftones, dried herbs, and pieces of looking-glafs; which he magnified, and improved into rocks, trees, and water: all which exhibit the folicitude and extreme activity that he had about every thing relative to his art; that he wifhed to have his objects embodied as it were, and diftinctly before him, neglecting nothing that contributed to keep his faculties alive; and deriving hints from every fort of combination."

He was alfo in the conftant habit of painting by night, a practice very advantageous and improving to an artift, for, by this means, he may acquire a new and a higher perception of what is great and beautiful in nature. His practice in the progrefs of his pictures was to paint on the whole together; wherein he differed from fome, who finifh each part feparately, and by that means are frequently liable to produce inharmonious combinations of forms and features.

Gainfborough was one of the few artifts of eminence this country has produced who never was indebted to foreign travel for his improvement and advancement in painting. Some ufe indeed he appears to have made of foreign productions; and he did not neglect to improve himfelf in the language of the art, the art of imitation, but aided his progrefs by clofely obferving and imitating fome of the mafters of the Flemifh fchool; who are undoubtedly the greateft in that particular and neceffary branch of it. He frequently made copies of Rubens, Teniers, and Vandyke, which it would be no difgrace to the moft accurate connoiffeurs to miftake for original pictures at firft fight. What he thus learned, he did not however fervilely ufe, but applied it to imitate nature in a manner entirely his own.

The fubjects he chofe for reprefentation were generally very fimple, to which his own excellent tafte knew how to give expreffion and value. In his landfcapes a rifing mound and a few figures feated upon, or near it; with a cow or fome fheep grazing, and a flight marking of diftance, fufficed for the objects: their charm was the purity of tone in the colour; the freedom and clearnefs of the touch; together with an agreeable combination of the forms: and with thefe fimple materials, which appear fo eafy as to be within every one's grafp, but which conftantly elude the defigner who is not gifted with his feeling and tafte, does he always produce a pleafing picture. In his fancy pictures the fame tafte prevailed. A cottage girl; a fhepherd's boy; a woodman; with very flight materials in the background, were treated by him with fo much character, yet fo much elegance, that they never fail to delight.

He was an excellent mufician, playing with exquifite tafte on the violin. His mind and manners were urbane and kind. If he felected for the exercife of his pencil an infant from a cottage, all the tenants of the humble roof generally participated in the profits of his picture; and fome of them frequently found in his habitation a permanent abode. His liberality was not confined to this alone; needy relatives and unfortunate friends were further incumbrances on a fpirit that could not deny; and owing to this generofity of temper, that affluence was not left to his family which fo much merit might promife, and fuch real worth deferve. He died, fincerely regretted by every lover of art, in 1788, aged 61, leaving behind him a very numerous body of works, both pictures and drawings; which are now fcattered over every part of this country.

Gainsborough, in *Geography*, a market town of Lincolnfhire, England, is feated on the eaftern bank of the river Trent, and confifts principally of one ftreet. In the year 1801 the town confifted of 1064 houfes, which were occupied by 4506 perfons. The river is navigable to this place for veffels of 150 tons burthen. By means of this ftream, which unites with the Humber river, and the Readley and Chefterfield canals, a confiderable trade in corn and other commodities is carried on.

According to ancient hiftory, it is related that king Sweyne anchored near this town with feveral Danifh veffels, in one of his depredatory expeditions to Britain. Matthew of Worcefter alfo ftates, that the fame monarch was murdered at this place. Leland defcribes an old ftone-chapel in the fouth part of the town, wherein, according to tradition, feveral Danes were interred. In the time of king Edward I., William de Valence, then lord of the manor, obtained a charter, or grant, from the monarch for holding a fair here. During the civil wars between king Charles and the parliament, this town was much injured by the contending parties.

The church is a modern pile of irregular building. In 1791 a fine ftone bridge, with three elliptical arches, was raifed over the river Trent. It is private property, and paffengers and carriages of all forts are fubjected to a toll for paffing over. An old hall, commonly called the palace, is a fingular edifice. It is conftructed principally of oak timber framing, and forms three fides of a quadrangular. This building was formerly furrounded by a moat, and had large gardens and fifh-ponds, &c. attached to it. Tradition afcribes it to John of Gaunt, duke of Lancafter, but it appears of a later age.

William de Gainfborough was a native of this place. He was an ambaffador from king Edward I., and for his zealous defence of the pope's infallibility, was, by Boniface VIII. preferred to the fee of Worcefter, where he died, A.D. 1308. Simon Patrick, bifhop of Ely, was born here in 1626, and died in 1707. About half a mile north of the town are fome embankments, called "the Caftle Hills." Thefe are faid to have been firft formed by the Romans, and afterwards altered and enlarged by the Danes. See Beauties of England, vol. ix.

GAIOPHRAGNIA, in *Natural Hiftory*, a genus of the firft order of *feptariæ*, divided by partitions of earthy matter.

GAIRSA, in *Geography*, one of the fmaller Orkney iflands, N.E. of Pomona. N. lat. 58° 51'. W. long 2° 51'.

GAISSERN, a town of the duchy of Stiria; 12 miles E. of Rottenmann.

GAIT, as applied to horfes, is a term that implies their method of going, or what is fometimes called their action.

Gait, in *Rural Economy*, is the name of a fort of open door, made ufe of for forming the entrance into an inclofure, &c. It alfo denotes a by-way acrofs a common field; and the going of a cow, or other animal, in a fummer pafture. A fingle fheaf of corn bound near the top, and fet upon its butt end to dry, is likewife in fome places called a gait. See Gate and *Harvefting* Grain.

GAITERS, a fort of fpatter-dafhes, ufually made of cloth, which are either long and reaching to the knee, or fhort, and only extending juft above the ankle.

GAL, *St.* See *St.* Gallen.

GALA Water, in *Geography*, a river of Scotland, which runs into the Tweed, about 2 miles above Melrofs, in Roxburghfhire.

GALABA, in *Ancient Geography*, a fmall town of Afia, fituated in the mountains, whence the river Calabas fprung.

GALACTITES, in *Mineralogical Antiquities*, a ftony fubftance differently defcribed by different authors of antiquity, who fcarcely agree in any other point refpecting its characters but that of its producing, when broken and triturated with water, a white fluid, comparable to milk (γαλα). This latter circumftance has likewife given rife to the appellations of galaxia, leucogæa, leucographa, expreffive of that quality; and it was alfo called, or rather confounded with, morochtus and fynophytes. According to Pliny it was found in the Nile, and other rivers, where it fometimes occurred, marked with red veins. It is recommended for its property of increafing the milk of nurfes, and hung on the necks of children, for promoting falivation and dentition. Sir John Hill, ever ready to defcribe what had not come under his obfervation, acquaints us that the galactites of the ancient writers is a very hard and dry fubftance, like an indurated clay, of a clofe compact texture, very heavy, and in colour of a pale-grey without the leaft admixture of any other tinge; that it is of a lefs even furface than the morochtus, and lefs hard; that it melts but flowly in the mouth, and leaves fomething of a lufcious fweetnefs on the tongue; that it does not adhere to the lips, nor ferment with acids, and in burning becomes of a pure white. This defcription is not applicable, in all its parts, to any one mineral fubftance we are acquainted with; while the defcription which others have given of galactites applies to feveral fubftances; and, indeed, various fubftances endowed with the quality alluded to muft neceffarily have been confounded at a period when the fcience of difcriminating natural fubjects was entirely unknown, and when fimilarity in fome uneffential external character was deemed fufficient to apply one and the fame name to things not bearing any affinity to each other.

Some of the modern writers on mineralogy have confidered galactites as the fame with morochtus, which is fuppofed to be the pulverulent variety of carbonate of lime, called mountain-

mountain-milk; but their reafons for this conjecture are as ill founded as thofe of others who think the galactites of the ancients to be foap-ftone, lithomarge, jafper, &c. Fortunately, neither the mineralogift nor the phyfician and antiquary have any reafon to regret the ignorance in which they are kept with regard to the true meaning of the name in queftion, which fhould be expunged from the fyftems of oeryctognofy.

GALACTOIDES, Γαλακτοειδης, of γαλα, *milk*, and ειδος, *form*, *milky*, a word ufed by the ancients in two or three different fenfes. Some ufed it to exprefs tepid, or little warm, with fuch a heat as that of milk juft drawn from the cow; others expreffed by it a white, fomewhat opaque, or milky-colour; others expreffed by it only a want of tranfparence in fluids. Galen frequently ufes it in the fecond of thefe fenfes, when treating of urines.

GALACTOPHAGI, and Galactopotæ, in *Antiquity*, perfons who lived wholly on milk, without corn, or the ufe of any other food.

The words are compounded of γαλα, γαλακτος, *milk*; φαγειν, *to eat*; and ποτης, of πινω, *I drink*.

Certain nations in Scythia Afiatica, as the Getæ, Nomades, &c. are famous, in ancient hiftory, in quality of galactophagi, milk-eaters. Homer makes their eloge, Iliad, lib. iii.

Ptolemy, in his Geography, places the galactophagi between the Riphæan mountains on one fide, and the Hircanian fea on the other.

GALACTO-PHORI Ductus, in *Anatomy*, from γαλα, *milk*, and φερω, *I bear*, the lacteals, fo named from the milky appearance of the fluid (chyle) which they contain. The excretory tubes of the mammary gland are alfo defcribed under the fame name. See Breast.

GALACTOPSIA, a method of curing difeafes by drinking milk only. The gout, confumption, and many other chronical difeafes, are by many affirmed to be curable by this means. See Cheyne's Nat. Meth. of curing Difeafes.

GALACTOSIS, of γαλακτουσθαι, *to be converted into milk*, the production of milk; or the action whereby the food, or chyle, is converted into milk.

GALACTOSPONDA, Γαλακτοσπονδα, of γαλα, *milk*, and σπονδη, *libation*, in *Antiquity*, a libation made with milk.

GALACUM, in *Ancient Geography*, a place of Britain, marked in the tenth rout of Antonine, and fuppofed to be Appleby between Whitley caftle and Overborough.

GALACZ, or Galatz, in *Geography*, a town of European Turkey, in Moldavia, on a lake near the conflux of the Prut and the Danube, chiefly inhabited by Greeks; 120 miles S.S.W. of Bender. N. lat. 45° 24′. E. long. 28° 24′.

GALADA, in *Ancient Geography*, a country of Arabia, called by Stephanus *Galadene*, and mentioned by Jofephus, and fuppofed to be referred to by Mofes in his account of the treaty between Jacob and Laban.

GALADES, in *Natural Hiftory*, an epithet given by Rondeletius to a fpecies of chama, remarkable for its milky whitenefs. It is derived from the Greek γαλα, *milk*.

This chama is a very elegant fhell.

GALAFIGUERA, Cape, in *Geography*, a cape on the S. coaft of Majorca. N. lat. 39° 36′. E. long. 2° 27′.

GALAICA Regio, in *Ancient Geography*, a country of Thrace, in which were fituated the following towns; *viz.* Sala, Zona, Mefambria, and Stryma; and faid by Herodotus (l. vii.) to have been denominated "Regio Britannica."

GALAN, a town of France, in the department of the Higher Pyrenées, and chief place of a canton in the diftrict of Tarbes; 15 miles E. of Tarbes. The place contains 1294, and the canton 7618 inhabitants, on a territory of 102½ kiliometres, in 10 communes.

GALANGAL, Galanga, a medicinal root, brought from the Eaft Indies; the produce of a plant of the fame name.

Its characters are thefe. It hath a fingle fpatha of one leaf; the flower has one petal with a flender tube, divided in fix parts, three of them alternately oval and fpear-fhaped, the other oval, and at bottom cut into two parts, which are vertically heart-fhaped; and it hath one ftamen which is membranaceous: it has a round germen, fupporting a ftyle the length of the tube; which afterwards become a roundifh three-cornered capfule with three cells filled with feeds. We have but one fpecies of this plant in England, known by botanical writers under the title of *Kæmpferia*, which fee.

There are two kinds of galangals, the *fmall* and the *great*. The fmaller is by far the moft in efteem, and is almoft the only one heard of in prefcription. The *galanga minor*, or leffer galangal, is a fmall fhort root, of an irregular figure, of the thicknefs of a man's little finger, and is feldom met with in pieces of more than an inch or two long. It has feveral protuberances at its ends, and on its furface, and is furrounded with many circular rings, that ftand out a little beyond the reft of the furface. It is of an extremely firm, and compact texture, yet not heavy; it cuts difficultly with a knife, and leaves a polifhed furface. Its colour is a brownifh red on the outfide, and a fomewhat brighter red within, though ftill with a confiderable admixture of brown.

The fmall galangals are to be chofen full and plump, and of a bright colour, very firm and found, and of an acrid and infupportable hot tafte.

They were formerly in common ufe as warm ftomachic bitters, and generally made an ingredient in bitter infufions; but they are now almoft wholly laid afide, on account of their unpleafant flavour. Bitternefs does not appear to be the proper medical character of this root; the heat and pungency greatly prevailing. A very fiery extract is made from it with rectified fpirit, and the watery extract is alfo very hot and pungent: in diftillation with water, it yields an effential oil, about a dram in quantity from fixteen ounces, of little fmell, and no great pungency: fo that the pungent matter of the galangal appears to be of the fame nature with that of pepper, refiding not in the volatile oil, but in a more fixed matter. Lewis, Mat. Med.

The larger galangal grows chiefly in Java and Malabar, and anfwers pretty much to the above defcription, only that it is larger in bulk, lefs unequal and tuberous, weaker, and more difagreeable than the leffer kind. The galangals are both brought us from the Eaft Indies, and are the roots of the fame plant, which is of the number of the *herbæ bulbofis affines* of Mr. Ray. Herman calls that which produces the larger, *bauchale Indorum*; and that which produces the leffer, *lagoudi Indorum*.

The people of the Eaft Indies ufe thefe roots by way of fpice.

GALANT. See Gallant.

GALANTHUS, in *Botany*, from γαλα, *milk*, and ανθος, *a flower*, alluding to its milky whitenefs. Snow-drop. Linn. Gen. 160. Schreb. 215. Willd. Sp. Pl. v. 2. 29. Sm. Fl. Brit. 352. Mart. Mill. Dict. v. 2. Lamarck Illuftr. t. 230. Juff. 55. Clafs and order, *Hexandria Monogynia*. Nat. Ord. *Spathaceæ*, Linn. *Narciffi*, Juff.

Gen. Ch. *Cal.* Spatha oblong, obtufe, compreffed, opening at the flat fide, permanent, moftly cloven at the top. *Cor.*

Cor. Petals ſix, oblong, obtuſe; the three outermoſt looſely ſpreading, concave, equal; the three innermoſt about half as long, parallel, emarginate, ſtriated. *Stam.* Filaments ſix, inſerted into the ſummit of the germen, capillary, equal, very ſhort; anthers oblong, cohering, taper-pointed, opening by two pores. *Piſt.* Germen inferior, globoſe; ſtyle thread-ſhaped, longer than the ſtamens; ſtigma ſimple. *Peric.* Capſule nearly globoſe, with three blunt angles, of three cells and three valves. *Seeds* ſeveral, globoſe.

Eſſ. Ch. Corolla ſuperior, of ſix petals; the three innermoſt ſhorteſt, emarginate. Stigma ſimple.

1. G. *nivalis.* Linn. Sp. Pl. 413. Engl. Bot. t. 19. Jacq. Auſtr. t. 313. The common ſnow-drop is the only ſpecies of this genus. It grows wild in rather mountainous or rocky places in Germany, Italy, and other parts of the ſouth of Europe, flowering in the early ſpring. Whether it be truly wild in England is much to be doubted. In gardens the flowers are often double, from a multiplication of the inner petals, which are elegantly ſtreaked with a glaucous green. Mrs. Barbauld has beautifully deſcribed this favourite harbinger of ſpring in the following terms.

"As Flora's breath, by ſome transforming power,
Had changed an icicle into a flower,
Its name and hue the ſcentleſs plant retains;
And Winter lingers in its icy veins."

Galanthus, in *Gardening,* comprehends a plant of the bulbous rooted flowering perennial kind, of which the ſpecies is the common ſnow-drop (G. nivalis). It has two varieties, one with ſemi-double, and the other with double flowers. The common ſort comes firſt into flower.

Method of Culture.—All the ſorts of theſe ſmall beautiful plants are capable of being increaſed with little trouble, ſimply by ſeparating and planting out the off-ſets from the old roots, in the latter end of ſummer, as ſoon as their leaves begin to decay, or very early in the autumn, in the ſituations where they are to remain. Care ſhould however be taken that ſuch off-ſets be not taken off more frequently than about once in three or four years. The planting muſt conſtantly be performed in large bunches containing a great number of bulbs, in order that they may produce the better effect when in blow. The different ſorts ſhould be carefully intermixed. They are well ſuited to the fronts of borders, clumps, and ſhady plantations, producing a fine appearance when in flower, which is at a very early period.

GALAPAGAR, in *Geography,* a town of Spain, in New Caſtile; ſix miles E. of Eſcurial.

GALAPAGOS, or Tortoise *iſles,* a cluſter of deſert iſlands in that part of the Pacific ocean, called by De Broſſes Polyneſia. Theſe iſlands have alſo been denominated the "Enchanted iſlands;" the largeſt being Maſcarin and Tabaco. They are all deſert, though ſituated in a delicious and fertile climate. The largeſt may be 10 Spaniſh leagues or 40 Britiſh miles in length, and 6 leagues in breadth; and they are ſeparated by many channels capable of receiving large veſſels. Capt. Dampier, in the 1ſt volume of his "Voyage round the World," has given the following account of them. The Galapagos are a great number of uninhabited iſlands, lying under, and on both ſides of the equator. The eaſternmoſt of them are about 110 leagues from the Main. They are laid down in the longitude of 181°, reaching to the weſtward as far as 176°, ſo that their longitude from England weſtward is about 68 degrees. Dampier, however, thinks that our hydrographers do not place them far enough to the weſtward. The Spaniards, who firſt diſcovered them, and in whoſe draughts alone they are laid down, report them to be a great number ſtretching N.W. from the line, as far as 5° N.; but Dampier did not ſee above 14 or 15. They are ſome of them, he ſays, ſeven or eight leagues long, and three or four broad. Capt. Vancouver, who paſſed through theſe iſlands without danger or obſtruction, obſerved that they lie from each other N.W. and S.E. at a diſtance of 21 miles, and that the ſouthernmoſt (S. lat. 1° 22′. E. long. 268° 18) did not appear to be above four miles in circumference, and the northernmoſt about a mile and a half. They are of a good height, moſt of them flat and even at the top; four or five of the eaſternmoſt are rocky, barren, and hilly, producing neither tree, herb, nor graſs, except ſome ſhrubs on the ſhore. In theſe iſlands there is water among the rocks in ponds and holes. Some others of theſe iſlands are moſtly plain and low, and the land more fertile, producing trees of different ſorts. Some of the weſternmoſt of theſe iſlands are nine or ten leagues long, and ſix or ſeven broad; the mould deep and black. Theſe produce large and tall trees, eſpecially mammee-trees, which grow in extenſive groves. In theſe large iſlands there are rivers of conſiderable ſize; and in many of the other leſſer iſlands there are brooks of good water. The Spaniards, when they firſt diſcovered theſe iſlands, found a multitude of guanoes, and land-turtle or tortoiſe, and hence named them the Galapagos iſlands. Dampier adds that he thinks no place in the world ſo plentifully ſtored with theſe animals.

GALAPHA, in *Ancient Geography,* a town of Mauritania Tingitana. Ptolemy.

GALARDIA, in *Botany.* See Virgilia.

GALARED, in *Geography,* a town of Sweden, in the province of Blekingen; 28 miles N. of Halmſtadt.

GALARIA, in *Ancient Geography,* a town of the iſland of Sicily.

GALARIPS, in *Botany,* a name originally given by Fred. Allamand to the fine South American plant, which Linnæus publiſhed by that of *Allamanda cathartica.*

GALARS, in *Geography,* a town of Tranſylvania; 16 miles S.E. of Hungad.

GALASA, in *Ancient Geography,* a town of Cœleſyria. Pliny.

GALASHIELS, in *Geography,* a flouriſhing little town of Scotland, in the county of Selkirk, on a ſmall river called Gala water, at its union with the Tweed. This town and its environs have long been famous for the manufacture of coarſe woollen cloth called "Galaſhiels grey," of which 50,000 yards have been made annually. The mode of huſbandry alſo in this neighbourhood has been much commended; five miles N. of Selkirk. N. lat. 55° 38′. W. long. 2° 53′.

GALASO, a river of Naples, which runs into the ſea near Tarento.

GALATA, a ſuburb of *Conſtantinople,* which ſee. See alſo Pera.

Galata, a ſmall iſland in the Mediterranean, near the coaſt of Tunis. N. lat. 38° 15′. E. long. 9° 30′.

GALATEA, in *Mythology,* a ſea nymph, the daughter of Nereus and Doris, thus called on account of the fairneſs and beauty of her complexion. Ovid and Theocritus repreſent Polyphemus, the moſt celebrated of the Cyclops, as in love with Galatea, and the rival of Acis; and that this hideous giant buried the young prince under a rock, and the gods transformed him into a river, or rather into a river-god. Some authors, however, are of opinion, that Acis was a young prince of Sicily, who was in love with the beauteous Galatea; and that in deſpair he threw himſelf into the river, which from that time has borne his name. See Nereids and Nymph.

GALATEO, in *Geography*, a town of Naples, in Calabria Ultra; eight miles E.S.E. of Nicotera.

GALATHEA, in *Natural Hiftory*, a genus of cruftacea in the Fabrician fyftem, including the Linnæan fpecies of cancri ftrigofus, branchiatus, gregarius, and amplectens. The character of this Fabrician genus confifts in having the antennæ of unequal length, the anterior ones pedunculate; pofterior feffile with the laft joint fetaceous; tail foliaceous. See article CANCER.

GALATI, a town of the ifland of Sicily, in the valley of Demona; 12 miles S. W. of Patri.

GALATIA, or GALLO-GRÆCIA, in *Ancient Geography*, a province of Afia Minor, bounded on the E. by Cappadocia, on the W. by Bithynia, on the fouth by Pamphylia, and on the N. by the Euxine fea. The Gauls having invaded Afia Minor in feveral bodies, of which Paufanias (Attic. c. 4.) has given an account, conquered this country, fettled in it, and called it Galatia, which in Greek fignifies Gaul, or rather, perhaps, New or Little Gaul. The Gauls were denominated by the Greeks "Celtes" or "Galatæ."

It is not eafy to afcertain the epoch of their eftablifhment in Galatia. At the death of Alexander, however, in the year 323 B. C. we find that the Gauls of Thrace and Illyria were difpofed to join the confederacy of Greece againft Macedonia; and that they aided Antigonus in the victory which he obtained over Antipater (321 B. C.). Thefe Gauls being afterwards attacked by Caffander, the fon of Antipater, and being obliged to retire to mount Hæmus (316 B. C.), were engaged anew in the fervice of Antigonus by the grant of a confiderable tract of country to be occupied by themfelves and their families. On this occafion they extended themfelves into Afia Minor, and became populous and powerful. This firft invafion of Afia by thofe Gauls, who attached themfelves to Antigonus, was followed by another fome time afterwards under the command of Brennus. At the commencement of the campaign Leonorix and Lutarix, otherwife denominated Leonorius and Lutarius, feparated from him with a body of 20,000 men; and having entered Thrace, made themfelves mafters of the coaft of the Propontis, and advanced to the Cherfonefus and the Hellefpont. After having furmounted many obftacles, Lutarix fucceeded in his progrefs to Afia; and Leonorix, in order to expedite the paffage of his troops thither, formed an alliance with Nicomedes, king of Bithynia, who furnifhed him with veffels for this purpofe, and enabled him to obtain in that country a confiderable eftablifhment (279 B. C.) Lutarix and Leonorix, who had for fome time conducted feparate expeditions, became again united in this treaty with Nicomedes; and concurred not only in accomplifhing the defigns of Nicomedes, but in making conquefts on their own account. About the fame time Attalus I., king of Pergamus, affigned a confiderable territory to thofe Gauls who ferved againft Antiochus; and it feems to have been about this period (278 years B. C.) that they eftablifhed themfelves in Afia Minor. Upon the whole we may obferve, that thefe feem to have been the principal epochas, to which we may refer the paffage of the Gauls into Afia. The firft was that in which the country occupied by the Galatæ or Gauls comprehended only that part of the Hellefpont which was ceded to Leonorix and Lutarix. The fecond was that in which Attalus (in the year 220 B. C.) affigned them a territory in Afia Minor; and the third was that in which Galatia, feparated from the Hellefpont by Epictetus, became extended from the weft towards the eaft, or from Phrygia Major to Pontus Polemaicus. Accordingly the firft eftablifhments of the Galatæ were towards the Ægean fea; in procefs of time they extended themfelves to mount Taurus; afterwards they obtained a more permanent eftablifhment, and gave the name of Galatia to the whole country which extended from the river Sangarius to the Halys.

The precife limits of Galatia are not eafily afcertained; as they have been various at different periods and varioufly affigned by different authors. The extent given to this country by Ptolemy, and ftated in the beginning of this article, is generally allowed to be much too confiderable, as it would comprehend the whole of Phrygia, Pifidia, and Lycaonia, and alfo the whole of Paphlagonia. The Galatæ who occupied it were diftributed into three divifions of people, each divifion including others of a fubordinate kind; thefe were the Tectofagi, the Trocmi, and the Toliftoboges or Toliftoboii. M. d'Anville places the latter to the weft, the Tectofagi towards the middle bearing northward, and the Trocmi towards the eaft. Pliny informs us that Galatia was divided into 195 tetrarchies. From Strabo we learn, that each of the three divifions of the people already mentioned was divided into four cantons, each of which had a tetrarch; and befides thefe 12 tetrarchs, there was a general council of the nation, compofed of 300 fenators. The tetrarchs were, as fome fay, hereditary, but, according to others, elective; but in procefs of time they underwent a variety of changes. Strabo fays, that they were at firft reduced to three, then to two, and at laft to one, which comprehended all the others, and which was poffeffed by Dejotarus. The laft tetrarch and king of Galatia was Amyntas, who from being fecretary to Dejotarus I., was made king of Pifidia in the year of Rome 714, and in 718, Marc Antony made him tetrarch of Galatia. After the death of Amyntas, Galatia was ranked by Auguftus among the Roman provinces, and fubjected to a proprætor, together with part of Phrygia, Pifidia, &c. but the three principal claffes of people, above enumerated, retained their peculiar denomination and form of government. The adminiftration of proprætors continued till the reign of Theodofius the Great, or of Valens; and under the Chriftian emperors it was divided into two provinces; Galatia Prima being fubject to a conful, and Galatia Secunda or Salutaris to a prefident. The former was fituated towards the eaft, contained feven towns, and had for its metropolis Ancyra; the fecond lay to the weft, and contained nine towns, the capital being Peffinonte. The religion of the ancient Galatæ was blended with much fuperftition; and they are faid to have worfhipped the mother of the gods under the name of Agdiftis. They offered human facrifices, devoting to this purpofe the prifoners whom they took in war. They were a tall and valiant people; their arms were ufually a fword and buckler, and they commonly fought naked. The impetuofity of their attack was irrefiftible, and almoft always made them victorious. Although the Galatians have been fometimes reckoned ftupid and barbarous, it appears, from the teftimony of different authors, that they applied to eloquence, and that they were fond of mufic. They had a particular inftrument, which was called "Carnyx." They ufed the bath, and have been commended for their chaftity and conjugal fidelity. They had fplendid repafts and feafts, in which they covered their tables with bread and flefh; and thefe forts of feftivals were terminated on the part of the rich by the diftribution of corn.

It appears from the acts of the apoftles, that Paul preached feveral times in Galatia; firft, A. D. 51 (Acts, xvi. 6); afterwards, A. D. 54 (Acts, xviii. 23.); and that he

he formed confiderable churches in this province. He was probably the firft who preached there to the Gentiles; although it is not unlikely, that Peter had preached there to the Jews, fince his firft epiftle is directed to the Jews, fcattered throughout Pontus, Galatia, &c. And the Jews converted by Peter probably occafioned thofe differences among the Galatian converts, which induced the apoftle Paul to write his epiftle, in which he takes pains to eftablifh his character of an apoftle, which had been difputed by fome, with a view of placing him below Peter, who preached, generally, to the Jews only, and obferved the law. For the date and purport of this epiftle, fee Epistle.

GALATOLA, in *Geography*, a town of Naples, in the province of Otranto; four miles E. S. E. of Nardo.

GALAVA, in *Ancient Geography*, a town of Great Britain, in the 10th rout of Antonine, fuppofed to be Old-Town, between Glanoventa or Lanchefter, in the county of Durham, and Alone or Whitley caftle.

GALAX, in *Botany*, from γαλα, *milk*, on account of the whitenefs of the flowers. Mitchel, who fent it to Linnæus, named it *Viticella*, the application of which is not very obvious. Linn. Gen. 109. Schreb. 151. Willd. Sp. Pl. v. 1. 1146. Mart. Mill. Dict. v. 2. Juff. 420. (Solenandria; Vent. Malm. 69. Blandfordia; Frafer in Andr. Repof. 343. Erythrorrhiza; Michaux Boreal-Amer. v. 2. 35.)—Clafs and order, *Pentandria Monogynia*. Nat. Ord. uncertain, Juff. *Ericæ*, Michaux.

Gen. Ch. *Cal.* Perianth inferior, in five deep, equal, acute fegments, permanent. *Cor.* Petals five, lanceolate, oblong, equal, notched at the fummit, flightly cohering at the bafe. Nectary tubular, of one leaf, half as long as the petals, in ten fegments at the top, five of which are dilated, and five alternate ones fhorter, the latter bearing the anthers. *Stam.* Filaments fcarcely any; anthers five, nearly feffile on the inner furface of the fhorter fegments of the nectary. *Pift.* Germen fuperior, ovate; ftyle none; ftigma flefhy, of three or four lobes. *Peric.* Capfule of three cells and three valves. *Seeds* numerous, minute.

Eff. Ch. Calyx in five deep fegments. Petals five. Nectary tubular, in ten fegments, alternately bearing the anthers. Capfule fuperior, of three cells and three valves. Seeds many.

1. G. *aphylla*. Linn. Sp. Pl. 289. Curt. Mag. t. 754. (Solenandria cordifolia; Vent. Malmais. t. 69. Blandfordia cordata; Andr. Repof. t. 343. Erythrorrhiza rotundifolia; Michaux Boreal. Am. v. 2. 35. t 36.)—Native of mountainous places in Georgia and Carolina, flowering in May. Mr. Frafer firft brought it to England. The *root* is perennial, compofed of very red fibres. *Stem* none. *Leaves* radical, heart-fhaped, doubly crenate, fmooth, on very long foot-ftalks. *Flowers* numerous in long-ftalked fpikes, refembling thofe of a *Clethra*. The Linnæan generic defcription, chiefly communicated by Mitchel, is fo very erroneous, that it is no wonder none of the botanifts who faw the plant could determine it, nor could the *Galax* of Linnæus ever have been certainly afcertained, but by his herbarium, where original fpecimens are preferved.

GALAXIA, from γαλα, *milk*, though the application feems not very evident, and the name is, befides, too near *Galax*. Thunb. Nov. Gen. 50. Schreb. 451. Willd. Sp. Pl. v. 3. 583. Juff. 57. Mart. Mill. Dict. v. 2. Cavan. Diff. 340. Lamarck Illuftr. t. 568. Gawler in Curt. Mag. 1208. Clafs and order, *Monadelphia Triandra*. Nat. Ord. *Enfatæ*, Linn. *Irides*, Juff.

Gen. Ch. *Cal.* Spatha of one or two membranous clofed leaves. *Cor.* of one petal, fuperior; tube long, thread-fhaped, erect, flightly dilated at the top: limb in fix deep regular, obovate, obtufe, fpreading fegments; the three outermoft having each a nectariferous cavity at its bafe. *Stam.* Filaments three, united into a tube; anthers ovate. *Pift.* Germen inferior, ftalked, obtufely triangular, fmooth; ftyle thread-fhaped, rather longer than the ftamens; ftigmas three, divided into numerous fpreading capillary fegments, almoft to their bafe. *Peric.* Capfule oblong, nearly cylindrical, with three furrows, three cells, and three valves. *Seeds* numerous, fmall, globofe.

Eff. Ch. Spatha of one or two leaves. Corolla regular, of one petal, in fix deep fegments, with an elongated tube. Style one. Stigmas three, in numerous capillary fegments. Capfule inferior, of three cells. Seeds globofe.

This is a Cape genus, firft eftablifhed by Thunberg, and moft allied to *Sifyrinchium*. Only two or three fpecies are known, which are of a diminutive ftature. G. *ovata* (*Ixia Galaxia;* Linn Suppl. 93) is figured in Curt. Mag. t. 1208. Andr. Repof. t. 94. Jacq. Ic. Rar. t. 291. The *leaves* are ovate and fhort. *Flowers* occafionally yellow or purple, very fugacious.—G. *graminea*, (*Ixia fugaciffima;* Linn. Suppl. 94), Curt. Mag. t. 1292, Jacq. Coll. v. 2. 366. t. 18. f. 2, differs chiefly in having narrow linear *leaves*. This genus appears to occupy the fame fituations on graffy hillocks at the Cape of Good Hope, as *Ixia Bulbocodium* does in the fouth of Europe, with which plant it alfo agrees in general afpect, as well as in the variable colour and fize of the bloffoms. The fpecies require the fame treatment as other Cape bulbs, and flower with us in the fpring.

Galaxia, in *Mythology*, a feftival in honour of Apollo, fo called becaufe they offered in it to that god a fort of furmety, of barley and milk.

GALAXY, in *Aftronomy*, the name given to that remarkable zone of light which forms nearly a great circle of the celeftial fphere, and which is by us called the *milky way*. It cuts the ecliptic near the two folfticial points, and is inclined to it about 60°. It traverfes the conftellations Caffiopea, Perfeus, Auriga, part of Orion, Gemini, the Great Dog, and the Ship, where it appears moft refplendent in fouthern latitudes; it then paffes through the feet of the Centaur, the Crofs, the fouthern Triangle, and returns towards the north by the Altar, the tail of the Scorpion, the arc of Sagittarius; it then divides into two branches, paffing through Aquila, Sagitta, the Swan, Serpentarius, and the head of Cepheus, and returns to Caffiopea. This path is defcribed in the poem of Manilius, who appears to have been very fortunate in his conjecture as to the caufe of this light:

> "Anne magis denfâ ftellarum turba coronâ
> Contexit flammas et craffo lumine candet
> Et fulgore nitet collato clarior orbis?"

Ariftotle, almoft always miftaken when he gives an opinion on fubjects of natural philofophy, fuppofes the milky way to be a luminous meteor placed in the middle regions.

Aftronomers have for a long time been difpofed to attribute this phenomenon to a great affemblage of ftars; but the queftion was firft put out of doubt by Dr. Herfchel, who completely refolved the whole mafs into feparate ftars; he has counted 50,000 in a fpace 15° long by 2° broad.

This, however, is far from fatisfying the curiofity of philofophers; an interefting queftion immediately arifes: Why fhould there be fuch a zone of ftars, and what explanation does it admit of? Dr. Herfchel is undoubtedly the aftronomer who has taken the moft pains in this inveftigation, and his theory is extremely plaufible, at leaft, if not entirely fatisfactory. He fuppofes the fidereal univerfe to be diftributed into

into nebulæ and clusters of stars, and the milky way to be that particular cluster in which our sun is placed. Under *Nebulæ*, we shall enter further into this theory; at present we shall only add a short extract, in Dr. Herschel's own words, from the Transactions of 1784.

"It is very probable, that the great stratum called the milky way, is that in which the sun is placed, though perhaps not in the very centre of its thickness. We gather this from the appearance of the galaxy, which seems to encompass the whole heavens, as it certainly must do if the sun was in the same. For, suppose a number of stars arranged between two parallel planes, indefinitely extended every way, but at a considerable distance from each other; and calling this a sidereal stratum, an eye placed somewhere within it will see all the stars in the direction of the planes of the stratum, projected into a great circle, which will appear lucid on account of the accumulation of the stars; while the rest of the heavens, at the sides, will only seem to be scattered over with constellations more or less crowded, according to the distance of the planes, or number of stars contained in the thickness or sides of the stratum.

"Thus in *fig.* 114. *Plate* XIII. *Astronomy*, an eye S, within the stratum *a b*, will see the stars in the direction of its length *a b*, or height *c d*, with all those in the intermediate situations projected into the lucid circle A B C D, while those in the sides *m v*, *n w* will be seen scattered over the remaining part of the heavens at M V N W.

"If the eye were placed somewhere without the stratum, at no very great distance, the appearance of the stars within it would assume a form of one of the less circles of the sphere, which would be more or less contracted to the distance of the eye; and if this distance were exceedingly increased, the whole stratum might at last be drawn together into a lucid spot, of any shape, according to the position, length, and height of the stratum.

"Let us now suppose, that a branch or smaller stratum should run out from the former, in a certain direction, and let it also be contained between two parallel planes extended indefinitely onwards, but so that the eye may be placed in the great stratum somewhere before the separation, and not far from the place where the strata are still united. Then will this second stratum not be projected into a bright circle, like the former, but will be seen as a lucid branch, proceeding from the first, and returning to it again, at a certain distance, less than a semicircle.

"Thus, in the same figure, the stars in the small stratum, *p q*, will be projected into a bright arch at P R R P, which, after its separation from the circle C B D, unites with it again at P.

"What has been instanced in parallel planes, may easily be applied to strata irregularly bounded and running in various directions; for their projections will of consequence vary according to the quantities of the variations in the strata and the distance of the eye from the same.

"And thus any kind of curvatures, as well as various different degrees of brightness, may be projected in the projections. From appearances, then, as I observed before, we may infer that the sun is most likely placed in one of the great strata of the fixed stars, and very probably not far from the place where some smaller stratum branches out from it. Such a supposition will satisfactorily, and with great simplicity, account for all the phenomena of the milky way, which, according to this hypothesis, is no other than the appearance of the projection of the stars contained in this stratum and its secondary branch. As a farther inducement to look on the galaxy in this point of view, let it be considered, that we can no longer doubt of its whitish appearance arising from the mixed lustre of the numberless stars that compose it. Now should we imagine it to be an irregular ring of stars, in the centre nearly of which we must then suppose the sun to be placed, it will not appear a little extraordinary, that the sun, being a fixed star, like those that compose this imagined ring, should just be in the centre of such a multitude of celestial bodies without any apparent reason for this singular distinction; whereas, on our supposition, every star in this stratum, not very near the termination of its length and height, will be so placed, as also to have its own galaxy, with only such variations in the form and lustre of it as may arise from the particular situation of each star."

In the year 1785, Dr. Herschel continued his investigations of the form of this stratum, and was enabled to give a figure of what he conceived to be a section of it. This is represented, *fig.* 115. If the celestial globe be adjusted to 55°, and σ Ceti be brought to the meridian, it will have the plane of this section pointed out by the horizon. The most distant star is supposed to be about 500 times farther from the sun than Sirius. Light would take 20,000 years to traverse the whole extent. The interior circle is about 40 times the distance of Sirius.

GALBA, Servius Sulpicius, in *Biography*, a Roman emperor, was consul under Tiberius, A. D. 33. Caligula gave him the command of the legions in Upper Germany, and with these he restored the ancient military discipline, and repressed the inroads of the natives. Upon the death of that emperor, he was urged by his friends to assume the imperial authority; but he chose rather to submit to the government of Claudius, who continued him in his command, and conferred upon him the proconsulate of Africa. In this high office, he conducted himself with the greatest propriety, and his victories were gratified by a public triumph. He afterwards passed several years as a private citizen, till he was nominated by Nero in 61 to the government of a province in Spain. In 68 he was declared emperor, and the death of Nero immediately followed. The new reign was full of troubles, and persons were found who were perpetually plotting against the power of Galba. He punished with great severity all whom he suspected as inimical to his government, and gave his confidence to persons of bad character. He retained his love of justice, but his rigour in various instances was carried to the bounds of cruelty; while in others, avarice and favour procured impunity to the most guilty. Virtue was, however, predominant in his mind; and the principal cause of his subsequent fate was a sentiment worthy of a sovereign: when urged to bestow largesses upon the soldiery, he said, "I have been accustomed to levy soldiers, not to buy them;" a sentence which they never forgot. Galba, finding himself in difficulties that might probably end in some fatal disaster, resolved to adopt a successor, and his choice fell upon Piso Licinianus, a person of illustrious birth, and of strict moral conduct. The senate approved the adoption; but Otho, who laid claim to the honour, immediately began to excite a conspiracy against him. The plan succeeded, a revolt broke out, and Otho was declared emperor. Galba attempted to rally his forces, but it was now too late; he was universally abandoned, and dispatched by a multitude of wounds. Such was the miserable end of this emperor, who was slain in the seventy-third year of his age, and in the seventh month of his reign. The virtues which had shone so bright in Galba, when in a private station, in many instances totally disappeared when he ascended the throne; and he who shewed himself the most impartial judge, forgot the duties of an emperor. He is one of many who would have been judged worthy of a crown had he never worn one.

Galba

Galba was the laſt emperor who claimed deſcent from the ancient families of Rome.

GALBÆ Castrum, or *fortreſs of Galba*, in *Ancient Geography*, a town of Africa, in Numidia.

GALBANETUM, a compoſition, or preparation, of galbanum, formerly preſcribed, but now much out of uſe.

GALBANUM, in *Pharmacy*, a gum, ſuppoſed by Linnæus to iſſue from an inciſion in the root of a fernlaceous plant, called, in Latin, *ferula galbanifera*, growing in Arabia, Syria, Africa, &c. The word is derived, according to Martinius, from the Hebrew *chelbenah*, *fat*. It is highly probable, that galbanum is obtained from different ſpecies of the Bubon, partly by its ſpontaneous exudation from the joints of the ſtem, but more generally, and in greater abundance, by making an inciſion in the ſtalk a few inches above the root, from which it immediately iſſues, and ſoon becomes ſufficiently concrete to be gathered. For an account of its properties and uſes, ſee Bubon *galbanum*. The compound pills of galbanum are prepared in the following manner: Take of galbanum gum-reſin an ounce, myrrh and ſagapenum, of each $1\frac{1}{2}$ ounce, aſſafœtida gum-reſin half an ounce, and as much ſyrup as is ſufficient. Beat them together till they form an uniform maſs. The doſe is from gr. x. to ℈ſs.

The beſt way of purifying it is to include it in a bladder, and keep it in boiling water, till it becomes ſoft enough to be ſtrained, by preſſure, through a hempen cloth: its eſſential oil will be thus preſerved, which is carried off in evaporation both by water and ſpirit. The eſſential oil of galbanum, diſtilled with water, riſes to the ſurface, of a yellowiſh colour, and in quantity about the 20th part of its weight. The empyreumatic oil is of a blue colour, and changes in the air into purple.

The galbanum colour was a prevailing faſhion with the Romans.

"Reticulumque comis auratum ingentibus implet,
Cærulea indutus ſcutulata, aut galbana raſa."
Juvenal, Sat. ii. l. 96.

And Martial, ſpeaking of an effeminate perſon, ſays,
"Galbanos habet mores." Lib. i. Epig. 97.

Commentators differ about the colour of "galbana raſa;" but the galbanum flower is deſcribed to be of a greeniſh yellow. See Bubon.

GALBULA, in *Ornithology*, the name of a bird of the thruſh kind, common in Italy and Germany, very remarkable for the elegant ſtructure and hanging of its neſt; and thence called by ſome *picus nidum ſuſpendens*, and by others *oriolus*, *chlor us*, and *icterus*, being ſuppoſed to be the icterus or jaundice-bird of Pliny, and the old writers. This bird, the loriot of Buffon, the witwall of Willughby, the golden thruſh of Edwards, and golden oriole of Latham, &c. &c. is ſomewhat larger than the common thruſh: its beak is a finger's breadth long, and red; its wing-feathers are black, but ſome are tipped, and others edged with white; others are varied with yellow, and the reſt are an extremely bright and beautiful yellow. The female is leſs beautiful, the yellow being more ſhaded with black and brown. The galbula feeds on inſects, and is in moſt places very much eſteemed at the table, but is no where to be had at all ſeaſons, being a bird of paſſage. See Oriolus *Galbula*.

Galbula is alſo a ſpecies of the *Alcedo*; which ſee.

GALDER, in *Geography*, a town of the iſland of Canary.

GALDETOOR, a town of Hindooſtan, in the circar of Cicacole; 36 miles W. S. W. of Viſigapatam.

GALDHEIM, a town of Germany, in the principality of Wurzburg; ſeven miles E. of Schweinfurt.

GALE, Thomas, in *Biography*, was born in 1507; and educated under Richard Ferris, afterwards ſerjeant-ſurgeon to queen Elizabeth. He was ſurgeon in the army of king Henry VIII. at Montruil, in 1544; and alſo in that of king Philip at St. Quintin, in 1557. He afterwards ſettled in London, and became very eminent in the practice of ſurgery. He was living in 1586. Biſhop Tanner gives the following liſt of his writings: "The Inſtitution of a Chirurgeon." "An Enchiridion of Surgery," in four books. "On Gun-ſhot wounds." "Antidotarie," in two books. All theſe were printed together, London, 1563, 8vo. "A compendious Method of curing præternatural Tumours." "On the Several Kinds of Ulcers, and their Cure." "A Commentary on Guido de Cauliaco." "An Herbal, for the Uſe of Surgeons." "A brief Declaration of the worthy Art of Medicine, and the Office of a Chirurgeon." "An Epitome of Galen de natural. Facultat." The two laſt were printed with a tranſlation of "Galen de Methodo Medendi." Numerous complaints of the intruſion of illiterate pretenders and empirics into the practice of medicine and ſurgery are interſperſed through theſe tracts; ſome of which are worth notice, as containing curious information reſpecting the ſtate of the profeſſion at that time. Aikin, Biog. Mem. of Med.

Gale, Theophilus, was born at Kings Teinton in Devonſhire in the year 1628. The early parts of his education he received under the roof of his father's houſe, who was vicar of the pariſh; he was afterwards ſent, for improvement, to a grammar ſchool in the neighbourhood, and in the year 1647 he was entered at Magdalen college, Oxford. In 1649 he was admitted to the degree of B. A. before he had attained the uſual ſtanding, at which, according to the ſtatutes of the univerſity, that degree is conferred; and in the following year he was the ſucceſsful candidate for a fellowſhip in his college. In 1652 he took his degree of M. A., became an eminent tutor, and likewiſe a diſtinguiſhed preacher. While he diſcharged the ſeveral duties connected with theſe functions, he applied himſelf to theological ſtudies, and was aſſiduous in collecting materials for his great work, publiſhed many years afterwards under the title of "The Court of the Gentiles." The plan of this publication was laid in early life, upon the firm conviction that it might be made to appear that "the wiſeſt and moſt eſteemed of the pagan philoſophers borrowed the moſt rational of their ſentiments, and were indebted for their moſt ſublime contemplations, from the Scriptures; ſo that how different ſoever they might be in their appearance, not only their theology, but their philoſophy and philology were derived from the ſacred oracles." To the accompliſhment of this plan he devoted a conſiderable portion of many of the beſt years of his life, though he was never negligent of thoſe duties incumbent upon him in the other characters which he ſuſtained. In 1657 he ſettled as a ſtated preacher at Wincheſter, where he acquired univerſal eſteem by his miniſterial ſervices, and by his exemplary life and converſation. Upon the paſſing of the Act of Uniformity, Mr. Gale found himſelf compelled to reſign his living, and he was at the ſame time deprived of his fellowſhip. Under theſe circumſtances, he undertook the tuition of the ſons of lord Wharton, with whom he went to Caen in Normandy, where there was a celebrated ſeminary of learning, under the direction of the moſt diſtinguiſhed profeſſors of the reformed religion in France. In 1665 he returned with his pupils to England, and reſided with them, till September in the following year, at their father's ſeat in Buckinghamſhire. On the firſt of that month he ſet out for

 London;

London; but before he reached that city, he beheld the conflagration which destroyed so large a part of the metropolis of England. This tremendous scene would have appalled the stoutest heart; to Mr. Gale it was peculiarly tremendous; the first tidings that reached his ears announced the destruction of the house and property of his best friend, and with these he had reason to fear the loss of a desk left in his hands containing all the MSS. which he had been so many years in accumulating. Scarcely had he reconciled his mind to the distressing event, when he met his friend, who assured him the desk and contents were happily saved from the flames. He now resolved to apply all his diligence in completing the work upon which he had already bestowed so much time and labour; and, having finished it, he applied to Dr. Fell, the vice-chancellor of Oxford, for a licence to print it. It was accordingly published at different periods; the first part came out in the year 1669, and was entitled, "The Court of the Gentiles; or, a Discourse touching the Original of Human Literature, both Philology and Philosophy, from the Scriptures and the Jewish Church." This specimen was received with great applause both at home and in foreign countries: and Mr. Gale published the remaining parts in 1671 and 1677. The whole was speedily translated into the Latin language, and the fame of the author was extended over every part of Europe. Mr. Gale had published, in 1676, "Philosophia Generalis, in duas partes, &c.;" the grand object of which was the same with that in "The Court of the Gentiles," but written in a more concise way, and intended for the use of persons engaged in a regular course of philosophical studies. In the beginning of the year 1678, he printed proposals for publishing, by subscription, "Lexicon Græci Testamenti Etymologicum, Synonymum sive Glossarium et Homonymum," which was intended as a lexicon and a concordance. The author had made considerable progress in the work, which was to have been comprised in one volume folio, when Death stopped his career: this happened in 1678, when he was only in the 50th year of his age. Mr. Gale was a man of great learning, talents, and industry, his manners were mild and inoffensive, his moral conduct irreproachable, and his piety towards his maker ardent and cheerful. He was zealously attached to what he thought the truth; steady in his adherence to the principles of non-conformity; and, having abandoned worldly good and temporal advantages, at the call of his conscience, he was at all times ready to vindicate his conduct, and give a reason of the hope that was in him. He was author of many other works beside those already noticed. These are enumerated in the Biographia Britannica, to which the reader is referred for further information.

GALE, THOMAS, was born at Scruton, in Yorkshire, about the year 1635, and was educated in Westminster school. From Westminster he went to Trinity college, Cambridge; where he took his degrees, and of which college he afterwards became a fellow. He was distinguished by his exact knowledge of the Greek language, of which he was appointed the Regius Professor. In 1672 he was chosen head master of St. Paul's school, and was employed to write the inscriptions on the monument, erected in memory of the dreadful conflagration in 1666; for which he was presented with a piece of plate. In 1676 he was collated to a prebend in the cathedral church of St. Paul's, and about the same time he was chosen a fellow of the Royal Society, to which he presented a Roman urn with its ashes; and about the year 1697 he gave the library of Trinity college a great number of curious Arabic MSS. Having continued 25 years head master of St. Paul's school, he was, as a reward for his great merit and incessant industry in that laborious occupation, promoted to the deanery of York. He died April 8, 1702, in the 68th year of his age, highly respected by all who knew him. He was a learned divine, a great historian and antiquary, and one of the best Grecians of his age. He was not only esteemed by his own countrymen, but kept up a valuable correspondence with many of the most learned men in foreign countries. He published new editions of various learned works, and likewise two volumes in folio of our ancient English historians. Biog. Brit.

GALE, ROGER, son of the former, a learned antiquarian, was born in 1672, and educated at Trinity college, Cambridge, of which he became fellow in 1697. He was representative of North Allerton, in Yorkshire, during three parliaments, and he held the office of commissioner of the excise. He was a fellow of the Royal and Antiquarian Societies, and of the last he was vice-president and treasurer. He published "Antonini Iter Britanniarum Commentariis illustratum Thomæ Gale, S. T. P. nuper Decani Ebor Opus posthumum revisit, auxit, edidit R. G. Accessit Anonymi Ravennatis Britanniæ Chorographia." In the preface to this work, he pointed out what was his father's and what was his own in this edition. Mr. Gale likewise published a work entitled "The Knowledge of Medals," &c. translated from the French of Joubert; "Registrum Honoris de Richmond;" "A Discourse on the four Roman Ways in Britain," and several papers in the Transactions of the Royal and Antiquarian Societies. He bequeathed his MSS. and a cabinet of Roman coins to Trinity college, Cambridge. His brother Samuel published "The History and Antiquities of the Cathedral Church of Winchester," which was begun by Henry earl of Clarendon, and continued to the year 1715. Biog. Brit.

GALE, JOHN, born in London in the year 1680, was instructed with great care in the learned languages, and in Hebrew, in which he had made a very considerable proficiency by the time that he was seventeen years of age. At this period he was sent by his father to the university at Leyden, where his progress was so great that in less than two years he took the degrees of M.A. and doctor of philosophy. From Leyden Dr. Gale went to Amsterdam, where he pursued his theological studies with great ardour, and having carefully improved himself in the knowledge of the Oriental languages, he undertook a critical examination of the Old and New Testament in their originals. So great was his reputation for real learning, that the university of Leyden offered him the degree of doctor in divinity, provided he would subscribe to the articles established by the synod of Dort. But he rejected the proposal, being resolved never to sacrifice his liberty for worldly profit or literary honours, and to call none master on earth but Christ. Dr. Gale had been educated in the principles of the antipædobaptists, and in 1705 he was called upon by his friends to justify his sentiments, by answering "The History of Infant Baptism," published by Mr. Wall, vicar of Shoreham, which history had been honoured by a vote of thanks of the House of Convocation. He accordingly drew up a series of letters on the subject, which were published in the year 1711, under the title of "Reflections on Mr. Wall's History of Infant Baptism, in several Letters to a Friend." In the course of these letters he vindicated his friend Le Clerc from the imputations of heresy and impiety cast on him by Wall and others, on account of his unwillingness to admit any human explanation of the doctrine of the Trinity as an article of Christian faith. Dr. Gale, on account of his extreme modesty, could not be prevailed on to undertake the pastoral office till he was thirty-five years of age. He then settled

with

with a congregation of baptists near Barbican, where he soon became a very popular preacher. His doctrines were liberal and scriptural, but he thought, that though the sacred writings were alone authoritative in matters of faith and practice, yet that an accurate acquaintance with the doctrines and discipline of the church, in the ages next the apostles, was highly desirable, as affording a view of the sense in which the sacred writings were then understood; with this view he became a member of a society for promoting primitive Christianity, which met weekly at Mr. Whiston's, for the purpose of examining the most ancient writers of the Christian church, to determine which of the pieces attributed to them were, and which were not genuine. On all occasions Dr. Gale proved himself a zealous friend to the object of these meetings, and exhibited an ardent desire of diving into the truth: nor was he less anxious to extinguish all disputes among Christians. In 1719 a furious controversy was excited among the dissenters in the west of England, on the subject of the Trinity, and respecting subscriptions to tests of orthodoxy: the London ministers were not neutral in the contest; many of them, to their disgrace, sanctioned the proceedings of the bigotted, intemperate, and persecuting party; but Dr. Gale, than whom no one was more respectable, was of the majority who subscribed an advice to their brethren in the country not to impose unscriptural subscriptions, in opposition to those who subscribed a contrary letter on that subject. Dr. Gale's "Reflections on Mr. Wall's History" produced an interview between the authors, at Mr. Whiston's, where the subject was discussed at large, but both parties retired more fully persuaded that their own doctrines were those of the truth. Mr. Wall drew up a vindication of his "History" and opinions, which obtained for him a diploma from the university of Oxford. Dr. Gale set about preparing an answer to his antagonist, but long before it was ready the world was deprived of the benefit of his exertions in the cause of religious liberty by his premature death. This event happened in the year 1721, when the doctor was only in the forty-second year of his age. He had, however, lived long enough to attach the friendship of many of the most eminent characters of the age, and to obtain, on account of the benevolence of his disposition and the mildness of his manners, the general respect and esteem of all who knew him. Among his particular friends may be mentioned the lord chancellor King; Dr. Hoadly, bishop of Bangor, and Dr. Bradford, bishop of Rochester. This worthy man, according to the usual course of events, might naturally have looked to a much farther extension of life, and had accordingly projected many valuable designs, of which one was an "English Translation of the Septuagint," according to the edition of Dr. Grabe; and another was "A History of the notion of Original Sin," in which he meant to shew its total inconsistency with just and honourable conceptions of an infinitely wise and good being. Soon after his death four volumes of his "Sermons" were published which were distinguished by the utility and importance of their subjects, and by the strength and clearness of the reasoning contained in them. Biog. Brit.

Gale, or *Gaule*, in *Botany*, a name of Dutch origin applied to the Candleberry Myrtle, *Myrica Gale* of Linnæus. See Myrica.

Gale, in *Geography*, a river of Ireland, in the northern part of the county of Kerry, which flows into the Cashin.

Gale, in *Rural Economy*, a term signifying a bull that has been castrated.

Gale, a *Sea Phrase*, for the blowing of the wind.

When the sea is not blown so hard, but that a ship can carry her top-sails a trip, that is, hoisted up to the highest, they say it is a *loom gale*.

When it blows very strong, they say it is a *stiff gale*, or at least a *fresh gale*; but when it blows so hard, and violently, that a ship cannot bear any sail, they say it blows a *storm*.

When two ships are near one another at sea, and there being but little wind blowing, one feels more of it than another; they say the ship *gales* away from the other.

Gale's *Creek*, in *Geography*, a river of North Carolina, which runs into the Atlantic. N. lat. 34° 44'. W. long. 77° 12'.

GALEA, or Galerus, among the *Romans*, was a light casque for the head, generally made of the skin of some wild beast, in order to appear the more terrible. Thus Virgil.

"—— fulvosque lupi de pelle galleros."

The galea was also a head-piece, coming down to the shoulders, commonly of brass, and sometimes of iron; the lower part was called *buccula*, and on the top was the crest.

Galea, in *Natural History*, the name of a genus of the *echinodermata*, or sea-hedgehogs, whose shape is that of a large elevated helmet, composed of several transversely-joined plates, or assulæ, and covered with very small and rough tubercles, in the shape of little granulæ. This genus, when fossile, is called in English the helmet-stone, and is marked with ten rows of double lines, either crenated, or punctuated, and running from the top to the base; the anterior ones being much longer than the rest.

Of this genus there are three known species, *viz.* 1. The scutated headed one, which has on its summit an oblong pentagonal plate like a shield. 2. The naked headed one without this shield. 3. That with the tæniæ laurated, and shewing that they have been once of the variolated kind. Klein's Echinod.

Galea, or *Galiot*, in *Naval Tactics*, a low built vessel for the conveyance of troops or stores, having both sails and oars.

Galea, in *Surgery*, signifies a kind of bandage for the head.

GALEACHABAD, in *Geography*, a town of Hindoostan, in Allahabad; 3 miles N.W. of Iconpour.

GALEAPOUR, a town of Bengal; 60 miles W.N.W. of Midnapour.

GALEANTHROPIA, of γαλεη, *cat*, and ανθρωπος, *man*, in the writings of the *Ancient Physicians*, a term used to express a species of madness, in which the patient fancied himself a cat, and endeavoured to perform all the motions of that animal.

GALEARII, in *Antiquity*, *helmet-bearers*; a name the Romans gave to the black guards, or servants of the soldiers. See Vegetius iii. 6. and Salmasius on the third chapter of the life of Adrian by Spartian.

GALEASSE. See Galley.

GALEATE Flowers. See Flowers.

GALEDUPA, in *Botany*, Rumph. Amboin. v. 2. 59. t. 13. Lamarck in Juss. 363. An Asiatic leguminous tree of which little is known. The *Pungam*, Hort. Mal. v. 6, 5. t. 3, cited by Jussieu with hesitation, seems to be very distinct.

GALEETO, in *Ichthyology*, the name of a fish of the alauda kind, called by Rondeletius *alauda non cristata*, and in

in Englifh the mulgranoc and the bullcard. See *Blennius* Pholis.

GALEGA, in *Botany*, a word, according to John Bauhin, Hift. Plant. v. 2. 342, of Italian origin, and from the fynonyms it feems poffibly to be a corruption of *herba gallica*. However obfcure or barbarous its fource, it has long been fanctioned by general adoption. Linn. Gen. 384. Schreb. 506. Willd. Sp. Pl. v. 3. 1239. Mart. Mill. Dict. v. 2. Juff. 359. Tourn. t. 222. Lamarck Illuftr. t. 625. Clafs and order, *Diadelphia Decandria*. Nat. Ord. *Papilionaceæ*, Linn. *Leguminofæ*, Juff.

Gen. Ch. *Cal.* Perianth of one leaf, tubular, fhort, divided half way down into five awl-fhaped, nearly equal teeth. *Cor.* papilionaceous; ftandard large, ovate, reflexed at the fummit and fides; wings oblong, almoft as long as the ftandard, each furnifhed with an appendage; keel oblong, compreffed, ftraight, tumid underneath towards the extremity, fharp above. *Stam.* Filaments diadelphous (fimple and nine-cleft); anthers oblong. *Pift.* Germen fuperior, flender, oblong; ftyle flender, afcending, fhorter than the germen; ftigma a minute terminal point. *Peric.* Legume very long, compreffed, pointed, furrowed with oblong ftreaks between the feeds. *Seeds* feveral, oblong-kidney-fhaped.

Eff. Ch. Calyx with awl-fhaped, nearly equal teeth. Legume of one cell, linear, with oblique ftreaks between the feeds.

This genus, originally eftablifhed on the Goat's Rue, *Galega officinalis*; Linn. Sp. Pl. 1062, has fince been much enlarged by the addition of many Cape, as well as tropical plants, fo that the fpecies in Willdenow amount to 37. Of thefe the G. *pifcatoria*, Ait. Hort. Kew. v. 3. 71, a native of the Eaft Indies and South-fea iflands, is ufed to intoxicate fifh, by being put into the water, fo as to caufe them to be eafily caught by the hand. Many of the *flowers* are ornamental, being ufually of a pink or purplifh colour. The *roots* are commonly perennial; the *ftems* often fhrubby. *Leaves* in feven fpecies ternate; in the reft elegantly pinnate, moftly with numerous elliptical leaflets.

There are two fpecies of Galega among the Chinefe. The firft and largeft is a thick, heavy plant, covered with a hard, reddifh bark, whitifh from within, and of a fharp, bitter tafte. Its bloom is like that of the pea, inodorous, fometimes of a blue and fometimes of a white colour. It gives vinegar a very agreeable tafte, and is reckoned a fpecific in diforders of the breaft. The fecond fpecies is a hard root, of the fize of a little finger, reddifh within and without, and of a ftronger and more aromatic tafte than the former. The plant arifing from it has the form of a little tree, with leaves fimilar to thofe of the myrtle. It fhould be felected frefh, juicy, of a high colour, compact, odoriferous, and with a ftrong aromatic tafte. The Chinefe cut it into pieces of the fize of a filbert, in order that it may be dried and carried about with more eafe. They confider it as an excellent antidote. Thefe two fpecies of Galega are cultivated in the province of Xanxy, and the merchants of the city of Tayvan moftly deal in them. Rochon's Madagafcar.

GALEGOS, in *Geography*, a town of Portugal, in the province of Entre Duero è Minho; 4 miles N.E. of Barcelos.

GALEIEN, a town of Pruffia, in Natangen; 25 miles S.E. of Brandenburg.

GALELA, a town on the E. coaft of the ifland of Gilolo. N. lat. 1° 58′. E. long. 127° 51′.

GALEN, Claudius, in *Biography*, a celebrated phyfician of antiquity, was born at Pergamus, a city of Afia Minor, in the hundred and thirty-firft year of the Chriftian era, and about the 14th or 15th of the reign of Adrian. From the place of his birth he obtained the furname of Pergamenus. He has himfelf informed us that his father, whofe name was Nicon, was an honourable and wealthy man, and poffeffed of confiderable knowledge of the belles lettres, philofophy, aftronomy, geometry, and architecture. Nicon was ambitious of initiating his fon in all the learning of the age; and, after having inftructed him in the rudiments of knowledge himfelf, fent him to the beft fchools of philofophy. Whilft engaged in ftudying the principles of the different fects, Galen foon difplayed his judgment, by felecting the various parts of the doctrines of the ftoics, academics, and peripatetics, which appeared to him rational, and totally rejecting the fafhionable fyftem of the Epicureans. About the age of feventeen, he began his attachment to the fcience of medicine, over which he was deftined to prefide for many centuries with oracular authority. During his youth he travelled much, partly with a view of profiting by converfation with the moft intelligent phyficians of the age, and partly for the purpofe of learning whatever related to the drugs, which were the products of different countries. He refided feveral years at Alexandria, which was then the great refort of men of fcience, and the beft fchool of medicine in the world. He vifited Cilicia, Paleftine, and the iflands of Crete and Cyprus; he made two voyages to Lemnos, in order to afcertain the nature of the Lemnian earth, which was deemed a medicine of extenfive utility; and he went to Cælo-Syria to examine the opobalfam. At the age of twenty-eight he returned from Alexandria to Pergamus, where his practice was attended with diftinguifhed fuccefs. Four years after this, in the thirty-fecond year of his age, he left his native place, and went to Rome, where he attempted to eftablifh himfelf. But he encountered much oppofition and jealoufy from the phyficians of that city, who adhered to the principles of the methodic fect; he was ftigmatized by them as a theorift, and even as a dealer in magic. Neverthelefs his merit was recognized by feveral Romans of learning and rank. He became extremely intimate with Eudemus, a peripatetic of great reputation, whom he cured of an obftinate intermittent; and he obtained the efteem of Sergius Paulus, the pretor; of Barbarus, the uncle of the emperor Lucius; of Severus, afterwards emperor; of Boëthus, a man of confular dignity, and others, before whom he made feveval diffections, and demonftrated efpecially the organs of refpiration and of the voice. But wanting temper and experience, neceffary to a fuccefsful conteft with a numerous and popular party, he returned to Pergamus, after a refidence of four or five years, under the pretence of avoiding the plague, which then raged in the metropolis of the world.

Galen had made himfelf known, however, to advantage; for he had not remained long in his native place before he was fent for to attend the emperors Marcus Aurelius and Lucius Verus, who were then at Aquileia. The appearance of the plague at this place compelled the emperors to depart haftily on their return to Rome, whither Galen foon followed. Lucius died on the road; but Galen had obtained fo much of the eftimation of the good Aurelius, that, during his famous expedition into Germany, he committed to him the care of his fons Commodus and Sextus. Thefe princes were feized with fevers, which Galen had the good fortune to cure; and he alfo gave a correct opinion of the iffue of their difeafes, contrary to that of all his colleagues, which raifed him to an eminence, from which he was able to defy the power, and finally to ruin the credit, of his former opponents.

It is not known with certainty how long Galen refided at Rome,

Rome, after he went thither the fecond time, or whether he ever returned to Afia; nor are his biographers agreed as to the age which he had attained at his death. It feems probable from his writings that he lived at Rome under the emperors Marcus Aurelius, Commodus, and Severus; and Fabricius afferts that he died at the age of feventy; which, if we calculate from his birth, muft have happened in the feventh year of the reign of the laft mentioned emperor, or in the firft year of the third century of the Chriftian era.

The high eftimation in which the character of Galen was held by his contemporaries, is evinced by the public refpect which he enjoyed to the end of his days, amid thofe violent political tumults that afforded very flender fecurity to the merits of other individuals. The greateft part of his life was fpent in the zealous purfuit of knowledge; and every fubject, poffeffing the moft remote, real or imaginary connection with medical concerns, became the object of his ardent inveftigation. As the fruits of his refearches, we are told, that he compofed five hundred different effays on the various parts of medicine, and half as many on other fcientific fubjects, connected with it. The confcioufnefs of his fuperior endowments, however, inflamed his vanity, and rendered him fomewhat contemptuous towards his brethren: he even prefumed to compare himfelf with the emperor Trajan, in refpect to the benefits which he conferred on the public. But great vanity was a common characteriftic of the learned men of his time.

Without entering into a long detail of all the particular treatifes written by Galen, it may be fufficient here to notice the different editions of the whole of his works that have been tranfmitted to us. The Greek editions are thofe of Aldus and Aud. Afulanus, printed at Venice, 1525, in five volumes folio, and of Hieron. Gemufæus, at Bafil, 1538, in the fame form. The Latin editions are, that of Paris, 1536, folio, printed by Simon Colinæus; and reprinted at Lyons in 1554, with additions and corrections, by Joan. Frellonius:—that of Bafil, 1542, folio, printed by Frobenius, and edited by Gemufæus:—thofe of Bafil again in 1549, 1550, and 1562; the laft of which contains a preface by Conrad Gefner, in which he comments with great judgment on the merits of Galen, and his works, and of his different tranflators:—the edition of Venice, 1562, with the corrections of John Baptift Rafario:—ten editions publifhed at Venice by the Juntas, in different years between 1541 and 1625; the ninth of which, printed in 1609, and the laft, are precifely the fame, and are the beft and moft correct:—laftly, an edition printed at Venice in 1541-45, by John Farræus, in feven volumes 8vo., with the notes of Ricci. An edition of Galen's works, both in Greek and Latin, in an elegant form, was publifhed at Paris, in thirteen volumes, folio, by René Chartrier, including alfo the works of Hippocrates; it is deemed a correct work. See Eloy. Dict. Hift. Le Clerc. Hift. de Med. For an account of the particular treatifes of Galen, fee the author laft quoted, and Haller. Biblioth. Med. Pract. Galen has twice mentioned our Saviour in his treatife "De differentia pulfuum;" and in his celebrated work "De ufu Partium Corporis humani," he has mentioned Mofes. Lardner's Works, vol. vii.

This great phyfician has recorded a ftory of the power of mufic over the paffions, fimilar to what has been related of Pythagoras by Boethius. He fays that Damon, the mufic-mafter of Socrates, feeing a young ftranger inflamed with wine, in fo violent a rage, that he was on the point of fetting fire to the houfe of his miftrefs, for preferring his rival to him; and, moreover, animated by the found of a flute playing to him in the Phrygian mode, had this young man reftored to reafon and tranquillity, by ordering the Tibicina, or female performer on the flute, to change her mode, and play in a grave and foothing ftyle, according to the meafure ufually given to the *fpondee*. Galen, though he differs much from Afclepiades on moft other fubjects, joins with him in the medicinal powers of mufic: and about the middle of the laft century, the learned Dr. Bianchini, profeffor of phyfic at Udine, collected all the paffages preferved in ancient authors relative to the medicinal application of mufic by Afclepiades, who flourifhed near a century before the Chriftian era; and it appears from this compilation, (entitled "La Medicina d'Afclepiade per ben curare le Malatie acute, raccolta da varii frammenti Greci e Latini," in Venezia,) that it was ufed as a remedy by the ancient Egyptians, Hebrews, Greeks, and Romans, not only in acute, but chronical diforders. And this writer gives feveral cafes within his own knowledge, in which mufic has been efficacious; but the confideration, as well as the honour, of thefe, more properly belong to *modern* mufic than to the ancient. See MEDICINA *Mufica*, where this fubject will be refumed.

GALEN, in *Geography*, a military townfhip of America, in Onondago county, New York, fituated on Canandarqua creek; 12 miles N.W. of the N. end of the Cayuga lake, and 13 S. by E. of Great Sodus. On the fouth it is bounded by Junius.

GALENA, in *Mineralogy*, lead mineralized by fulphur. (See LEAD, *Sulphuretted*.) The meaning formerly conveyed by this term was vague; for, befides fulphuret of lead, alfo common or black blende was meant by it. It was alfo ufed by Wallerius and others as a prefix to the names of various metals to denote their fulphurets: thus we have Galena antimonii or ftibii, which is our grey-antimony-ore; Galena cobalti, or white and grey-cobalt-ore; Galena zincina, Galena bifmuthi, &c.

GALENA *Inanis*, a name given by authors to a glittering fubftance, very much refembling fome of the plated ores of lead, but really containing none of that metal.

GALENIA, in *Botany*, fo denominated by Linnæus in memory of the celebrated ancient phyfician Galen. Linn. Gen. 194. Schreb. 263. Willd. Sp. Pl. v. 2. 436. Mart. Mill. Dict. v. 2. Juff. 84. Clafs and order, *Octandria Digynia*. Nat. Ord. *Succulentæ*, Linn. *Atriplices*, Juff.

Gen. Ch. *Cal.* Perianth minute, inferior, four-cleft, concave; its fegments oblong. *Cor.* none. *Stam.* Filaments eight, capillary, hardly fo long as the calyx; anthers of two lobes. *Pift.* Germen fuperior, roundifh; ftyles two, fimple, reflexed; ftigmas fimple. *Peric.* Capfule roundifh, of two cells. *Seeds* two, oblong, angular.

Eff. Ch. Calyx four-cleft. Corolla none. Capfule roundifh, of two cells, containing two feeds.

1. G. *africana*, Linn. Sp. Pl. 515. Suppl. 227. (Atriplex africana lignofa lutefcens, rorifmarini foliis; Till. Hort. Pif. t. 15.) "Upright, fhrubby. Leaves linear, flefhy."—Native of Africa. A humble plant of no attractive afpect, fomewhat refembling an *Afparagus*, with terminal panicles of fmall inconfpicuous greenifh-white *flowers*, which are feffile in the forks of the panicle.

2. G. *procumbens*. Linn. Suppl. 227. "Procumbent. Leaves ovate, channelled, with fpreading recurved points."—Gathered by Thunberg at the Cape of Good Hope.

GALENICAL SYSTEM. The profeffors of medicine at Rome were divided into a number of fects at the time when Galen appeared; and of thefe the methodifts appear to have been in the higheft eftimation, and the empirics in the loweft, while the dogmatics were again divided in regard to the authority to which they appealed, fome preferring the tenets of Hippocrates, others thofe of Erafiftratus, of Afclepiades, &c. (See EMPIRIC). But Galen treated with derifion thefe

these slaves of authority, and professed himself of the eclectic class, who adopted whatever was valuable in the writings of all physicians indiscriminately. Hippocrates, however, was the author whose works he held in the highest estimation, and he seemed to consider himself as the first who had discovered the true interpretation of his language. After writing much in the way of comment on the father of physic, and even defending his principles against those of some of the sectarians, he established his own system by filling up the outline, as it were, of the theory of Hippocrates, to which he made numerous additions. This system was formed with considerable ingenuity, and was sufficiently plausible, in the absence of more accurate physiological knowledge, to be received as the true system of nature, and to occupy the attention of the medical world for thirteen centuries, excluding all rational investigation, and therefore retarding, rather than assisting, the progress of the science. We can only pretend to give a slight sketch here of the opinions of this extraordinary man.

Galen maintained, with Hippocrates, that the body was composed of four elements, fire, air, water, and earth, which were possessed of the qualities of hot, cold, moist, and dry. While these elements and qualities remained in just proportion to each other, the different parts of the body were in a state of just *temperament*, and performed their respective functions well; in other words, the body remained in health. But when any of these elements or qualities became deficient or excessive, an *intemperies* ensued, the functions were imperfectly or painfully performed, or altogether ceased. The organs of the body, he also remarked, were or were not in a proper state in respect to size, figure, number, situation, connection, or disunion: and these circumstances included all the varieties of health and disease. Hence the business of the physician was, on the one hand, to maintain the proper *temperament*, and to correct any *intemperies*; and on the other, to preserve the size, figure, number, situation, and connection of the organs, and to re-establish these conditions when disordered. From this view of the subject two axioms were deduced. The first was, that it is necessary to retain all the parts in their natural condition, by means which are similar in quality or power: *i. e.* heat is adapted to preserve the quality of heat in a hot part, cold to retain the quality of cold in a cold part, &c.; and, in like manner, we must guard against the circumstances which tend to alter the figure, size, connection, &c. of the organs. This maxim related to the *preservation of health*. The second regarded the *cure of diseases*, and inculcated the necessity of correcting the intemperies, and the derangements in point of size, figure, &c., by means of *contrary quality or power; i. e.* where a warm part is become cold, heat must be applied; and where a certain motion, or by violence an organ has been displaced, a motion or violence of an opposite tendency must be employed to restore it to its situation; and so on. In a word, contraries are cured by their contraries, "contraria contrariis medentur."

All the curative intentions of the practitioner were fulfilled, according to Galen, by diet, medicines, or manual operation. The principal practical maxims which Galen adopted upon these points were those which Hippocrates had taught. It must be observed, however, with respect to pharmacy, or the preparation and use of drugs, that much additional knowledge had been acquired since the time of Hippocrates, and many new medicines had been employed, both simple and compound. Upon the subject both of simple medicines, and of compounding them, Galen wrote many treatises; and as he had employed some fancy in assigning the particular intemperies to each disease, in the various combinations of hot and dry, hot and moist, cold and moist, &c.; so he exercised the utmost stretch of imagination in determining the properties of simples. For these properties were deduced from the four primary qualities of hot, cold, moist, and dry, and were conceived by him to exist each in four different degrees. Thus the quality of hot, for instance, was possessed by different substances in the first, second, third, or fourth degree. Cichory was believed to be cold in the first degree, and pepper to be hot in the fourth degree. By the different combinations of these qualities, in their different degrees, he supposed that all medicines operated: and he even explained the sensible qualities of certain substances, such as sour, salt, acrid, &c. as depending upon the primary qualities just mentioned. Thus saltness, he said, originated in the principle of heat; bitterness he deduced from dryness; sourness from cold; &c. These latter qualities, however, he considered as differing from the former, in the one instance being *actual*, in the other *potential*: thus fire is actually hot, pepper potentially; ice is actually cold, mandrake potentially. In these speculations, it is obvious that Galen admitted the phantoms of the imagination to supply the place of observation and experience: but even this comprehensive theory, like other gratuitous systems, left many facts to be explained by some occult principle, or specific cause, the final resort of human ignorance. The common operation of purgatives was explained by a specific attraction of each purgative substance for a certain humour, which it discharged: hence, though Galen employed blood-letting to diminish plethora, he used purgatives only with the intention of evacuating *cacochymy*, or morbid humours.

There are other points in the physiology of Galen, which, for the sake of perspicuity, we have omitted to notice in the preceding sketch; but which merit attention, inasmuch as they constitute in part the foundation of the language of physiologists, even in the improved condition of our knowledge in modern times. With Hippocrates, he divided the living body into three principles, or component parts, the *solids*, the *humours*, and the *spirits*. The solids he subdivided into simple, and compound or organic. Of the fluids he recognized the four humours of Hippocrates, the *blood*, *phlegm*, *bile*, and *black bile*, or melancholy, and their relations to the four elemental properties which that ancient physician had maintained: namely, he regarded the blood as a red, hot, and moist humour; the phlegm, as white, cold, and moist; the bile, as yellow, hot, and dry; and the melancholy, as a black, cold, and dry humour. With respect to the spirits, Galen divided them into three species, the *natural*, *vital*, and *animal* spirits. The first of these were only a subtile vapour, arising from the blood, and deriving their origin from the liver, which he deemed the elaboratory of the blood. These natural spirits, when carried to the heart, and mixed with the air, taken in by respiration, became vital spirits; which again were converted into animal spirits in the brain. These three sorts of spirits he considered as the instruments of the three different faculties, resident in the parts in which each sort of spirits was formed. The *natural* faculty, or function, he placed in the liver, and believed it to preside over the nutrition, growth, and generation of the animal body. The *vital* function he lodged in the heart, and conceived, that by it heat and life were communicated to every part of the body through the canal of the arteries. The *animal* faculty, including the rational principle, he placed in the brain, and considered it as distributing the power of motion and feeling to every part, through the medium of the nerves, and as presiding over the other faculties. (See FUNCTION.) These three faculties produced the three sorts of actions, according to Galen, which are designated by the same epithets, and

which

which he divided into *internal* and *external*. The internal animal actions are imagination, judgment, and memory; the external are the five senses, and motion. The internal vital actions are violent passions, as anger, &c.; the external are motion, the pulsation of the arteries, and distribution of the spirits through them, diffusing life and heat. The internal natural actions are sanguification, the digestion of food, and the actions connected with it; the external are the distribution of blood by the veins for the purposes of nourishing, enlarging, and preserving the body. Besides these general faculties, Galen admitted of particular faculties, residing in each organ of the body, and directing its movements: and if he were asked, what was the prime mover of all these faculties, he answered with Hippocrates, Nature.

We shall not attempt to detail his numerous divisions of disease, or his views of the different causes, symptoms, diagnostic and prognostic signs, which his slavery of system led him to arrange in peculiar orders and classes. Before we conclude, we must remark, that the little and equivocal notice of the pulse taken by the more ancient physicians, is amply compensated by the copiousness of Galen; who, after making it the greatest study of his life, left behind him sixteen or seventeen different treatises on this single subject. But it was a more abundant source of absurd hypothesis than any of his other speculations: nevertheless he evinced his prudence, in pointing out the necessity of comparing the state of the pulse with all other symptoms, before a final judgment of any disease is formed. Le Clerc. Hist. de la Med. Walker's Memoirs. For a full account of the extent of the anatomical acquirements of Galen, the reader may consult the elaborate work of Monf. Le Clerc, just quoted. It remains for us only to notice the

GALENICAL *Pharmacy*, which formerly stood in opposition to *chemical* pharmacy. The medicinal substances used by Hippocrates were generally given singly, and in the most simple forms. Deviations from this rational custom, however, had extended to an incredible degree before Galen, much of whose time was employed in arranging according to his own theories the multifarious compositions of his predecessors. But instead of simplifying, he conjoined with the labour of methodizing, a zeal to enlarge the overgrown catalogue. Excepting, however, in the number of ingredients, supposed to possess similar qualities, which he heaped together in boundless profusion, his pharmacy possessed considerable simplicity; for it included only vegetable productions, and was confined to the mere operations of powdering, boiling, or infusing. This Galenical or vegetable pharmacy remained, for ten centuries, a perfect code, or sealed book, from which practitioners in medicine thought it little less than sacrilege to deviate, even on the most minute occasions.

When the chemical researches of Paracelsus and Van Helmont had introduced certain preparations of mercury, and other metallic or mineral substances, into the materia medica, these innovations were opposed by the followers of the doctrines of Galen, and the partisans assumed respectively the titles of *Galenists* and *Chemists*. These titles, however, are now extinct, and the numerous frivolous hypotheses of both sects are exploded: the science of modern times, while it has found the necessity of discarding from the catalogue of the materia medica numerous simples employed by the Galenists, and of simplifying their multifarious compounds, has at the same time borrowed from the laboratory of the chemists some of the most active and salutary agents upon the living animal body.

GALENISTS, in *Medicine*, see the preceding article.

GALENISTS, or *Galenites*, in *Ecclesiastical History*, are a branch of Mennonites, or Anabaptists, who take in several of the opinions of the Socinians, or rather Arians, touching the divinity of our Saviour.

In 1664, the Waterlandians were divided into two parties, of which the one were called Galenists, and the other Apostoolians.

They are thus called from their leader, Abr. Galenus, a learned and eloquent physician of Amsterdam, who considered the Christian religion as a system, that laid much less stress on faith than practice; and who was for taking into the communion of the Mennonites all those who acknowledged the divine origin of the books of the Old and New Testament, and led holy and virtuous lives.

GALEOBDOLON, in *Botany*, from γαλεη, *a weasel*, or *cat*, and βδολος, a *fœtid scent*. It has occasionally been a synonym for some species of *Galeopsis*, or plants akin to that genus, and is retained by Linnæus as the specific name of the yellow Archangel, made a distinct genus by Hudson. Hudf. Fl. Angl. 257. Sm. Fl. Brit. 631. (Galeopsis; Linn. Gen. 292. Schreb. 389. Juss. 114. Leonurus; Willd. Sp. Pl. v. 3. 115.) Class and order, *Didynamia Gymnospermia*. Nat. Ord. *Verticillatæ*, Linn. *Labiatæ*, Juss.

Gen. Ch. *Cal.* Perianth of one leaf, tubular, with five unequal spreading teeth, each armed with a spinous awn, permanent. *Cor.* of one petal, ringent; tube short, dilated upwards; limb gaping; upper lip incurved, elliptical, concave, entire; lower in three equal, acute segments; without any teeth at the edge of the orifice of the tube. *Stam.* Filaments four, awl-shaped, incurved under the upper lip, two shorter than the others; anthers roundish, bifid. *Pist.* Germen superior, four-cleft; style thread-shaped, about the same length and position as the stamens; stigma in two sharp spreading divisions. *Peric.* none, except the dried rigid calyx. *Seeds* four, angular, abrupt.

Eff. Ch. Calyx five-cleft, unequal, awned. Upper lip of the corolla entire, vaulted; lower in three acute segments.

1. G. *luteum*. Hudf. 258. Sm. Engl. Bot. t. 787. With. 530. (G. Galeopsis; Curt. Lond. Fasc. 4. t. 40. Galeopsis Galeobdolon; Linn. Sp. Pl. 810. Dreves t. 20. Lamium luteum; Raii Syn. 240.) Yellow Dead-nettle; or Weasel-snout.—Native of groves throughout Europe, to which it is very ornamental in the spring. It rather prefers a moist soil, and is perennial. The habit is that of a *Lamium*, not of a *Galeopsis*. *Stems* simple. *Leaves* opposite, stalked, heart-shaped, serrated. *Flowers* about six in each whorl, large, yellow, prettily speckled with red. The herb has no very remarkable flavour, or quality. No other species is known.—Linnæus originally referred this plant to Leonurus, in which he has been followed by Scopoli, and more recently by Willdenow. The habit does not well accord, nor is the upper lip villous as in that genus.

GALEOLA, in *Natural History*, the name of a genus of the *echinodermata*, or sea hedge-hogs of the galeated, or helmet kind.

They have their name from the Latin *galeola*, a diminutive of the word galea, and which signified with the ancient Romans a drinking-vessel, made in the shape of a small helmet. Of this genus there are three known species. 1. A papillose kind, covered with small eminences. 2. An undulated kind, with its striæ resembling waves. 3. The smooth kind. Klein.

GALEOPSIS, in *Botany*, from γαλεη, *a weasel*, or *cat*, and οψις, *aspect*, an old name, alluding to the mouth of the flower. Dr. Sibthorp, however, has proved the γαλιοψις of Dioscorides

Diofcorides to be *Scrophularia peregrina.* Linn. Gen. 292. Schreb. 389. Willd. Sp. Pl. v. 3. 91. Mart. Mill. Dict. v. 2. Sm. Fl. Brit. 628. Juff. 114. Lamarck Illuftr. t. 506. Clafs and order, *Didynamia Gymnofpermia.* Nat. Ord. *Verticillatæ,* Linn. *Labiatæ,* Juff.

Gen. Ch. *Cal.* Perianth of one leaf, tubular, with five rather unequal fpreading teeth, as long as the tube, each armed with a fpinous awn, permanent. *Cor.* of one petal, ringent; tube fhort; limb gaping; orifice rather wider than the tube, as long or longer than the calyx, bearing on each fide, at the bafe of the lower lip, a little pointed tooth-like protuberance, hollow at the back; upper lip roundifh, concave, ferrated at the top; lower in three fegments, the lateral ones roundifh, the central largeft, emarginate, and crenate. *Stam.* Filaments four, awl-fhaped, concealed by the upper lip; two of them fhorteft; anthers roundifh, cloven. *Pift.* Germen fuperior, four-cleft; ftyle thread-fhaped, about the fame length and pofition as the ftamens; ftigma in two fharp fpreading divifions. *Peric.* none, except the rigid, upright or clofed calyx. *Seeds* four, angular, abrupt.

Eff. Ch. Calyx five-cleft, awned. Upper lip of the corolla notched, vaulted; lower with two teeth on its upper fide.

Obf. Linnæus remarks, that in G. *Ladanum* the upper lip of the corolla is fomewhat reflexed at the apex, and fcarcely at all crenate, but we do not find this quite applicable to our plant; fee Eng. Bot. t. 884. In G. *Tetrahit* Dr. Smith obferved at Matlock a remarkable variety of ftructure, the terminal flowers of each branch having a regular quadrifid falver-fhaped corolla, with four equal fpreading ftamens, whilft all the others were of their ufual fhape. See Linn. Fl. Lapp. ed. 2. 201. Some botanifts take this genus, at leaft fome of its fpecies, for the γαλιοψις of Diofcorides, whilft others fuppofe *Lamium purpureum* to be what he intended under that name. The late profeffor J. Sibthorp has, in our opinion, fettled the point by obfervations on the fpot, and propofes *Scrophularia peregrina* as moft correctly anfwering to all the ancient defcriptions, as well as growing where Diofcorides relates. See Prodr. Fl. Græc. v. 1. 406 and 435. He found no real *Galeopfis* in Greece or its neighbourhood. We have four fpecies of *Galeopfis* in England, of which G. *verficolor,* Engl. Bot. t. 667, often called the Bee Nettle, from the refemblance of its lip to the Bee Orchis, is the moft fpecious, and is truly a beautiful flower. It grows in fandy fields, and, like its congeners, is an annual, eafily propagated by feed. The herbage has an inelegant nettle-like afpect, befet with pungent prickles. Willdenow's Species Plantarum enumerates four fpecies, but he has not our G. *villofa* among them, and he divides G. *Ladanum* into two, perhaps not improperly.

GALEPSUS, in *Ancient Geography,* a Greek town which authors have attributed, at different periods, to Thrace, or to Macedonia. It was fituated on the weftern coaft of the peninfula, adjoining, on the weft, to that on which mount Athos ftood. This peninfula was denominated Sithonia. Galepfus was about a mile from the coaft, having to the N.W. Myla, and to the S.E. Torone, which gave name to the Toronaic gulf. It was a colony of Thafians, according to Thucydides.

GALERA, in *Geography,* a town of Spain, in the province of Grenada; 5 miles S.S.E. of Huefca.—Alfo, a town of Spain, in the province of Catalonia; 5 miles S.S.W. of Tortofa.

GALERA, a fmall ifland in the Mediterranean, on the coaft of Minorca.

GALERA, *Cape,* a cape on the coaft of South America, on the Spanifh Main. N. lat. 11°. W. long. 75° 20'.—Alfo, the eaft point of the ifland of Trinidad. N. lat. 10° 45'. W. long. 60° 30'.—Alfo, a town of Italy, in the Patrimony of St. Peter; 9 miles S.E. of Bracciano.—Alfo, a river of Mexico, which runs into the Pacific ocean. N. lat. 15° 55'.

GALERA, in *Zoology,* a fpecies of *Muftela;* which fee.

GALERIA, or GALARIA, in *Ancient Geography,* a town of Sicily, according to Diodorus Siculus. Stephanus, the geographer, calls the town "Galarina Urbs," and the country "Galaria."

GALERIA, *Gulf of,* in *Geography,* lies on the N.W. coaft of the ifland of Corfica. N. lat. 42° 27'. E. long. 8° 44'.

GALERICULATE FLOWERS. See FLOWERS.

GALERITA, in *Ichthyology,* the crefted blenny, called alfo adonis. See BLENNIUS.

GALERIUS, furnamed *Armentarius,* and ftyled alfo the younger *Maximian,* in *Biography,* was appointed Cæfar by Dioclefian, March 1ft, A. D. 292, and in the year 305 advanced to the Imperial throne. In 307, he elevated Licinius to the rank of Auguftus, fo that at this time there were in reality fix Roman emperors, *viz.* Maximian, Galerius, Conftantine, Maximin, Maxentius, and Licinius. Galerius died in 311, of a long and grievous diftemper, fuppofed to have been inflicted upon him as a judgment from heaven for his inhuman treatment of the Chriftians. For other particulars relating to him, fee DIOCLESIAN and PERSECUTION.

GALERON, in *Geography,* a town of the ifland of Celebes, celebrated for its fifhery; 15 miles from Macaffar.

GALESUS, (CERVARO,) in *Ancient Geography,* a river of Italy, in the vicinity of Tarento, mentioned by Virgil and Martial.

GALETS, in *Geography,* an ifland at the N.E. end of lake Ontario, and in the ftate of New York; 3 miles S.W. of Roebuck ifland.

GALETTE, LA, a neck of land in the river St. Laurence, in Canada. The land adjoining to it is very good. It is 1½ league above the fall called Les Galots.

GALETTE, *Riviere à la Vielle,* a river of Upper Canada, which runs into the river St. Laurence, above ifle Fort Levi. N. lat. 44° 46'. W. long. 75° 27'.

GALEUS, in *Ichthyology.* See SQUALUS.

GALEUS *Rhodius,* a name given by Athenæus and fome other of the old writers, to a very large and delicate fifh. Schoneveldt is of opinion, that they meant by it the fturgeon, and brings many good reafons for his opinion. See ACIPENSER *Sturio.*

GALEUS *Stellatus,* the *ftarred hound fifh,* in *Ichthyology,* a kind of hound fifh remarkably fpeckled, with white fpots in form of ftars.

GALEXIA, a name given by Galen, and fome of the other ancient writers, to the common lamprey.

GALGALA, in *Geography,* a town of Hindooftan, in the country of Vifiapour; 48 miles S. of Vifiapour. N. lat. 16° 42'. E. long. 75° 25'.

GALGON, a town of France, in the department of the Gironde; 5 miles N. of Libourne.

GALGULUS, in *Ornithology,* a fpecies of *Pfittacus;* which fee.—Alfo, a fpecies of *Corvus;* which fee.—Alfo, a fpecies of *Coracias,* Coracias garrula, or roller; and alfo the Coracias finenfis; fee CORACIAS.—Alfo, a fpecies of *Tetrao,* or the Tetrao nævius. See TETRAO.

GALHANO, in *Geography,* a town of Portugal, in the province of Beira; 12 miles N.E. of Coimbra.

GALI, in the *Materia Medica,* a name given by fome to the

the indigo, or feculæ of the plant anil, ufed in dyeing, &c. Garcias gives us this name, and fays, that the plant is like the mangirique; but Clufius tranflating this word by ocymum or bafil, has ftrangely perplexed the cafe: the anil or indigo plant not having any refemblance of that herb.

GALIAN, in *Ichthyology*, a fpecies of *Cyprinus*; which fee.

GALIANI, Ferdinand, in *Biography*, was born in the year 1728, at Chieti, a town of Abruzzi, where his father, a nobleman, was affeffor of the royal court of juftice. He was deftined for the ftudy of the law, and was carefully educated with that view. He was much given to fatire, and being refufed admiffion into an academy, he made ufe of his powers of invective againft that body before he was eighteen years of age, which firft made him known as a writer. In a fhort time afterwards he applied his talents to more important and ferious fubjects. The public finances of the two Sicilies had become much deranged, and various plans had been propofed to remedy the evil, but without fuccefs. War and fome other events caufed a prodigious influx of money into them from Spain, France, and Germany; many regulations were immediately made to promote the trade, the arts, and the profperity of the country; neverthelefs the fpecie feemed at once, as it were, to difappear; the price of commodities fuddenly rofe; a great alteration took place in the courfe of the exchange, and many commercial houfes were reduced to a bankrupt ftate. In this ftate of affairs Galiani wrote a work in five books "On Money and Specie," which was publifhed in the year 1750. Diffident, perhaps, of his own talents, he printed it without his name, and it was for a confiderable time a principal topic of converfation. Few works, at that period, difplayed fo much order, precifion, and boldnefs of thought, and in which the fubject was treated in fuch clear and elegant language. It was received with univerfal approbation in his own country, and among the literati of other nations. When its fame was fully eftablifhed, the author difcovered himfelf, to the great joy of his uncle, the archbifhop of Tarento, and his other friends. He now obtained preferment in the church, and at the expence of his uncle he was enabled to make a tour through Italy, which procured him an acquaintance with the moft eminent men of letters in that country. About the year 1755 he began to form a collection of all kinds of ftones found in the neighbourhood of Vefuvius, and having amaffed one hundred and forty-one fpecimens, he publifhed a treatife, in which he gave an explanation of them; and immediately tranfmitted the collection, with the printed defcription, to pope Benedict XIV., and on one of the boxes he infcribed the following words:

"Beatiffime pater, fac ut lapides ifti panes fiant."

The holy father was fo much pleafed with the prefent and with the infcription, that he gave Galiani the living of Canonica, worth four hundred ducats per annum. He became a member of the academy of Herculaneum, the object of which was to explain and illuftrate the antiquities of Herculaneum, Pompeia and Stabia; a confiderable fhare of the bufinefs fell to his lot, which he performed with much diligence and fagacity. On the death of Benedict XIV. his friend and patron, he wrote his eulogy, and difplayed upon the occafion a vaft flow of eloquence, as well as much of the noble principle of gratitude. This was in 1758, and in the following year he was appointed fecretary to the French embaffy, which was the commencement of his public career. He was but little pleafed with Paris at firft, but his wit and convivial turn procured him admiffion into the firft company, the friendfhip of the moft eminent literary characters, and the general reputation of a great man. At Paris he begun to write annotations on Horace, in which he examined the occafion and fubject of each poem, and exhibited the progrefs which Horace himfelf made in poetry till he attained to a perfection that can never be imitated. In the year 1763, the celebrated geographer Zannoni of Padua was at Paris, having been invited thither by Louis XVI., for the purpofe of determining the boundaries between the French and Englifh poffeffions in America. Galiani employed him to make a new and improved map of the kingdom of Naples. In confequence of an alarming fcarcity of corn, which had prevailed in France for many years, and which had often been the occafion of diftrefs, famine, and infurrection, Galiani wrote, in the French language, a work on the corn trade, confifting of eight dialogues. The king, to encourage, as he thought, the interefts of agriculture, prohibited, in the year 1764, the free exportation of corn from all the provinces of the kingdom. Galiani undertook to fhew that this and other regulations adopted by the court were the caufes of the fcarcity, and of the numerous diforders that attended it. While he remained at Paris, he did not venture to oppofe the prejudices of the country, but as foon as he left that place, his work appeared under the title of "Dialogues fur le Commerce des Bleds;" Londres 1770-8; and it immediately excited confiderable attention in France. Numerous writers appeared againft him till the court interfered in favour of the fyftem recommended by Galiani. Upon his return to Naples the moft confiderable men of France entered into an epiftolary correfpondence with him: their letters form nine large volumes in quarto. He died in October 1787, in the fifty-ninth year of his age. He is faid to have poffeffed his ufual fpirits and vivacity till his laft moments. Befides the commentary on Horace, and the dialogues already referred to, he wrote, in three books, "A treatife on the innate Propenfities or Inclinations of Men, or the Principles of the Law of Nature and Nations, deduced from the Poems of Horace." To this work was prefixed a life of the poet, which contained no information but what was collected from his poems. In 1779 he publifhed a book on the Neapolitan dialect; in which he explains the grammatical rules of it, and gives an account of all the writers who have made ufe of it. He was employed on a work "On the natural Duties of Princes to other belligerent Powers," which made its appearance in 1782, and was afterwards tranflated into the German language. It was written in confequence of the war between the Englifh, French, and Spaniards, in which the Neapolitans, and other courts, remained neuter. The merit of Galiani was known and refpected by the feveral monarchs of Europe, and no ftranger of diftinction arrived at Naples without endeavouring to form an acquaintance with him. The emperor, Jofeph the Second, during his refidence in that city, often honoured him with an interview. Catharine the Second of Ruffia not only fent him prefents, but requefted the academy of Peterfburgh, in the year 1782, to elect him a member. A life of Galiani, written by Louis Diodati, was publifhed at Naples in 1788. Gen. Biog.

GALIATA, in *Geography*, a town of Italy, in the department of the Gogna, fituated between the Tefino and the Gogna; 4 miles N.E. of Novara.

GALIBIS, or Charaibes, a nation of Indians, inhabiting near New Andalufia, in South America; from which fome have fuppofed the Charaibes of the Weft Indies to be defcended.

GALICANA, a town of the republic of Lucca; 13 miles N. of Lucca.

GALICIA, or Galitzia, a province, or kingdom, taken from

from Poland by the houfe of Auftria; compofed of the palatinates of Lublin, Sandomir, and Cracow; together with Little or Red Ruffia, including the palatinates of Lemberg, Chelm, and Belz; a part of the palatinates of Bielfk, Volhynia, Mafovia, and Podolia; and a fmall portion of the Lithuanian palatinate of Brfefk. This province lies to the north of Hungary, from which it is feparated by the Carpathian Mountains; about 280 miles in length, and from 60 to 100 in breadth. The capital is Lemberg or Leopol. It is watered by the Dneifter, the San, and feveral other rivers.

GALIGNANA, a town of Iftria; 14 miles N.E. of Rovigno.

GALILEANS, Galilæi, a fect among the ancient Jews, denominated from Judas of Galilee, or the Gaulonite, their chief; who, efteeming it unworthy that the Jews fhould pay tribute to ftrangers, raifed up his countrymen againft the edict of Auguftus, which had ordered a cenfus or enumeration to be made of all his fubjects.

Their pretence was that God alone fhould be owned as mafter, and called by the name of the *Lord*: in other refpects they had much the fame doctrine as the Pharifees; but as they judged it unlawful to pray for infidel princes, they feparated themfelves from the reft of the Jews, and performed their facrifices apart. The fons of Judas were crucified in the time of Claudius. His grandfon Eleazar, after Jerufalem was taken, defended a ftrong fortrefs with 960 of his moft defperate followers. When the battering ram had made a breach, they turned their fwords againft their wives, their children, and at length againft their own breafts. They died to the laft man.

As our Saviour and his apoftles were of Galilee; they were fufpected to be of the fect of Galileans; and it was on this principle, as St. Jerome obferves, that the Pharifees laid a fnare for him; afking whether it was lawful to give tribute to Cæfar; that in cafe he denied it, they might have an occafion of accufing him. Vid. Jofeph. Ant. Jud. lib. xviii.

The learned Dr. Lardner has fhewn in his "Jewifh and Heathen Teftimonies," (apud Works, vol. vii. p. 355.) that the Chriftians in early days, as well as afterwards, were opprobrioufly called Galileans. (Acts, ii. 7.) Epictetus, in the time of Adrian, about the year of our Lord 120, feems to refer to Chriftians under this appellation; and the emperor Julian, who both defpifed and hated the Chriftians, and who, well apprized that they gloried in the name of their redeemer, countenanced, and perhaps enjoined, the ufe of the lefs honourable appellation of Galileans.

GALILEE, in *Ancient Geography*, a province of Afia, being a part of Paleftine, fituated to the north of the country of Samaria. This province was divided into Upper and Lower Galilee. The former included the half tribe of Manaffeh (fee Manasseh), and was called "Galilee of the Gentiles," probably becaufe it contained moft of that defcription, who had been fpared by the Manaffites, or rather, becaufe it lay contiguous to the heathen nations. The latter, or Lower Galilee, was fo called on account of its fituation, being flat and low in comparifon of the other, which was altogether mountainous. The Lower Galilee lay on the fartheft northern verge of Judea, and included the tribes of Afher, Zabulun, Naphtali, and Iffachar, fettled by lot. This country was very fertile and champaign, except on the northern fide towards Syria; produced excellent corn, wine, oil, fruits of all forts, with little labour; and was, in its flourifhing ftate, fo full of towns and villages, that Jofephus, who was made governor of it, informs us, the leaft of them contained 15,000 fouls; but allowing for his exaggeration, the country was really very rich and populous, and its inhabitants, active and laborious, were ftout and warlike, and very zealous for the Jewifh religion. As the country was very fertile, it was of courfe very populous. It had, in particular, a fpacious valley, fo very rich, that it was emphatically denominated "the Fat valley," fince better known by that of St. George, from a fort or caftle built in it, and dedicated to that faint. As Nazareth was fituated in this province, our bleffed Lord was called a Galilean. The Galileans feemed to have had a dialect different from that of the Jews in general, for Peter was hence denominated a Galilean.

Galilee, *Sea of*, fo called becaufe it was almoft furrounded by the province of the fame name, a lake of Paleftine, formed by the river Jordan, which ran through it, and fupplied it with frefh water. This is alfo ftyled in the facred writings the fea and lake of Kinnereth, or Cinnereth, and the lake of Genefareth or Genezar. The Jewifh hiftorian commends it highly, amongft other things, for the fweetnefs, coolnefs, and excellence of its water, as well as the abundance and variety of its fine fifh. It was in this lake that the apoftles Peter, Andrew, John and James exercifed their profeffion of fifhermen. According to Jofephus, it was 100 furlongs in length, and about 40 in breadth.

Galilee, in *Architecture*, a portico which was ufually built at or near the weft end of the great abbey churches. Such a one ftill remains, under the name of the "galilee," at the weftern extremity both of Durham and Ely cathedrals. In this porch the monks collected themfelves, and drew up in returning from fome of their proceffions. Here alfo dead bodies were fometimes depofited previoufly to their interment; and here alone, in certain monafteries, females were allowed to fee the monks of it to whom they were related, or even to attend divine fervice. Hence, the galilee at Durham was fitted up in a very ornamental way for this purpofe, and a line of blue marble was drawn from the principal entrance on the north fide of the church to the oppofite fide, beyond which women were not allowed to go eaftward towards the high altar, but were required to turn weftward into the galilee. Many improbable conjectures have been formed concerning the derivation of this name. The real occafion of it feems to be this. When any female applied at the abbey gate for leave to fee her relative who was a monk there, fhe was directed to the weftern porch of the church, and told in the terms which fo frequently occur in the fervice of the pafcal time, alluding to Mat. xxviii. 10. and Mark xvi. 7, that "fhe fhould fee him in Galilee." This explanation is confirmed by a paffage of Gervafius, the monk of Canterbury. De Combuft. et Repar. Dorob. Ecc. Twyfd. X. Script.

GALILEI, Vincenzio, in *Biography*, a Florentine nobleman, and father of the great Galileo Galilei, had received inftructions in mufic from Zarlino; but being a performer on the lute, and of courfe a friend to the doctrines of Ariftoxenus, which Zarlino, a favourer of tempered fcales, conftantly combats, he cenfured his mafter in a fmall tract, entitled "Difcorfo intorno all' Opere di Zarlino;" which not paffing unnoticed in the fecond volume of the theorift's works, Galilei, in 1581, publifhed "Dialogo della Mufica antica e moderna, in fua difefa contra Giufeppe Zarlino," in which he becomes an open antagonift. To analyfe the reafonings on both fides of this controverfy would afford the reader very little fatisfaction, as it would be difficult to render the fubject interefting; we fhall therefore only obferve that befides the difpute with Zarlino, this work contains many mifcellaneous articles, fome of which are amufing and curious; however, there are others which are contra-

contradictory, and hazarded without sufficient information or enquiry; and the author manifests no deep research into antiquity, when he boldly asserts, p. 101, that the *battuta*, or beating time, was *not* practised by the ancients; and p. 133, that the monochord was invented by the Arabians.

It was the opinion of Galilei, that in his time there were not more than four great performers on the organ, who were likewise composers, in all Italy, which more abounded with musicians than any other part of the world; and these were Annibale Padovano, Claudio da Coreggio, Giuseppi Guami, and Luzzasco Luzzaschi. He mentions the viola d'arco and violone, but not the violin: and complains of the musical *embroiderers* of his time, who, by their changes and divisions, so disguised every melody, that it was no longer recognizable, but resembled the representations of the first painters in oil, Cimabue and Giotto, which required the names to be written under them for the convenience of the spectator, who, without such assistance, would be unable to distinguish a rose from a lily, a rabbit from a hare, a sparrow from a linnet, or a lobster from a trout.

He says, that the Italians, who were in possession of the harp before the time of Dante, had it from Ireland; and adds, that it is only a cithara with many strings; having, when Galilei wrote, four octaves and a tone in compass. And as the harp came from the cithara, so the harpsichord had its origin from the harp: being nothing more than a horizontal harp, as every one who examines its figure with that idea must see. The *cetera*, or guittar, he says, was furnished to Italy by the English, who were formerly famous for making such instruments.

Galilei is said to have been assisted in this controversy by Girolamo Mei, a Florentine nobleman, mathematician, philosopher, and theoretical musician.

Battista Doni, in his "Trattato 2do. sopra gl'Instrumenti di Tasti," or keyed instruments, says, that in the beginning of his musical studies, his partiality for the music of the ancients was greatly increased by the perusal of the Dialogue of Galilei, in which Mei had the greater part, (dove il Mei ebbe la meggior parte), and still more by a treatise written by this learned personage (Mei) De Modis Musicæ, a MS. presented to the Vatican library by Monsig. Guarengo, Op. Om. tom. i. p. 324. Doni has supported this assertion by no proof; but in the Vatican library, among the queen of Sweden's MSS. there is a volume of inedited tracts and letters, written by Girolamo Mei, upon the music of the ancients, in which are discoverable, not only opinions similar to those of Galilei, but frequently the words in which they are expressed in his Dialogue; particularly in a letter from Mei, dated Rome, 1572, in answer to two that he had received from Galilei, in which he seems to have been consulted concerning the usual difficulties which those have to encounter who undertake to discuss the music of the ancients. We procured a copy of this entire letter, and considerable extracts from the other writings of Mei, which indeed contain the whole substance of Galilei's Dialogue, except what concerns his controversy with Zarlino relative to the musical scales and proportions of the ancients.

G. Battista Doni, speaking of the inventors of recitative, says, Vincenzio Galilei was at this time in some credit among musicians, and, flattered with his reputation, he pursued his studies with such diligence, that after the publication of his "Dialogue on Ancient and Modern Music," he attempted new things, and with the assistance of sig. Barde, count of Vernia, he was the first who composed melodies for a single voice; having modulated that pathetic scene of Count Ugolino, written by Dante, which he sung himself very sweetly to the accompaniment of a viol. This essay certainly pleased very much in general; however, there were some individuals who laughed at the attempt; notwithstanding which, he set, in the same style, parts of the Lamentations of Jeremiah, which were performed to a devout assembly.

GALILEI, GALILEO, an eminent mathematician, philosopher, and astronomer, flourished towards the close of the 16th and beginning of the 17th centuries, and immortalized his name by his inventions and discoveries. He was the son of Vincenzio Galilei (see his article), and born at Pisa, in Italy, in the year 1564. The attention of his youth was engaged by the amusing studies of poetry, music, and drawing; but in the progress of his years these were exchanged for other and sublimer sciences, in which he was destined to excel. Intended by his father for the medical profession, he was educated in the university of Pisa; but conceiving a dislike to the study of medicine, as well as to the Aristotelian philosophy which was then taught in the schools, the predominant bias of his mind led him to cultivate an acquaintance with mathematics, and with the other sciences that are connected with it; and he was allowed by his father to indulge his natural inclination without restraint. Having been well instructed in the Greek language, he read Euclid, Archimedes, and other mathematicians in the original. The reputation which he acquired in this department of science was so distinguished, that, before he was 26 years of age, he was appointed by the duke of Tuscany to the chair of mathematical professor in the university of Pisa. In the regular discharge of his professional duties he gave satisfaction to the more liberal and enlightened of his auditors; but his situation was rendered unpleasant to him by the envy and jealousy of the bigotted Aristotelians, who took occasion to reproach him as a visionary and dangerous innovator. Disgusted by their conduct, he accepted, in the year 1592, an invitation which he received from the republic of Venice to occupy the mathematical chair in the university of Padua. In this situation he continued for 18 years, contributing very much to the reputation and popularity of the seminary with which he was connected. Tuscany, however, by degrees felt an increasing ardour for improvement; and the patriotism of Galileo rendered him desirous of devoting his services to the benefit of his native country. His inclination being made known to Cosmo II., the grand duke, he was immediately invited to Pisa, and in 1611 appointed professor of mathematics, with a considerable stipend. The grand duke afterwards invited him to Florence, giving him the title of principal mathematician and philosopher to his highness, and continuing his salary of professor at Pisa, without the obligation of residence. In this, as well as in other situations, Galileo united with the study of mathematics that of physics, and particularly the doctrines of mechanics and optics. Indeed, before his settlement at Padua he had written his "Mechanics," stating the advantages to be derived from that science and its instruments; and also his "Balance," for finding the proportion of alloy in mixed metals. Being informed, in the year 1609, that Jansen, a Dutchman, had invented a glass, which made distant objects appear as if they were near, he turned his attention to the subject, and invented and constructed an instrument, by which, as he says, objects appeared magnified one thousand times. Turning this instrument, or telescope, towards the heavens, he was even astonished by the objects that presented themselves to his view. On the surface of the moon he saw lofty mountains and deep vallies. The galaxy, or milky way, he discovered to be a crowded assemblage of fixed stars, invisible to the naked eye. Venus

he

he found to vary in its phafes like the moon. The figure of Saturn he difcovered to be oblong, confifting of three diftinct parts, two of which were *anfæ,* or extreme parts of the ring. Jupiter he faw furrounded with four moons, which he named Medicean ftars: and on the fun's difc he perceived fpots, from the motion of which he inferred, that the fun revolves about its axis. The duke of Tufcany, to whom he dedicated an account of thefe difcoveries, wrote him a congratulatory letter on the occafion; and whilft aftronomers in general applauded his attempts, fome fufpected that his fuppofed difcoveries were the amufing dreams of his own imagination. Defirous of applying his difcoveries to fome practical ufe, he engaged his patron, the duke, to apprize the king of Spain of the great benefits which navigation might derive from them; but his fuggeftion feems to have been difregarded. Convinced of the truth of the Copernican fyftem, he availed himfelf of his difcoveries in illuftrating and confirming it; and though he publifhed a treatife, in which it was proved, from the authority of the fathers and orthodox divines, that the language of Scripture is not to be ftrictly followed in queftions that are merely phyfical, the ignorant and bigotted clergy were alarmed; and this incomparable philofopher was, in the year 1615, cited before the court of inquifition, accufed of herefy, and thrown into prifon. The charge of herefy was fupported by allegations againft him, that he maintained the two following propofitions, *viz.* that the fun is the centre of the world, and immoveable by a local motion, and that the earth is not the centre of the world, nor immoveable, but that it moves with a diurnal motion. Thefe propofitions, which he was not fuffered to explain or defend, he was ordered by the inquifition to renounce, and he was prohibited from vindicating them either in converfation or writing. It is generally faid, that he was actually committed to the prifon of the holy office, and confined there about five months; but fome accounts ftate, that in confequence of the interpofition of the duke of Tufcany, and of other perfons of high rank and influence at the papal court, he was treated with mildnefs, and merely threatened with imprifonment, if he fhould prove refractory. It is certain, however, that he was obliged to conform to the decree of the inquifition before he was permitted to leave Rome. Having obtained his releafe, he refumed and purfued his ftudies, and laid before the public an account of his difcoveries, which tended more and more to eftablifh the opinions which the court of inquifition had condemned. In the year 1632, notwithftanding the danger to which he expofed himfelf, he had the refolution to publifh his famous "Dialogues on the two greateft Syftems of the World, the Ptolemaic and Copernican," urging arguments in favour of each, without abfolutely deciding for either, but infinuating his attachment to that of Copernicus. In thefe dialogues he alfo introduces fome ftrokes of raillery againft the Ariftotelians, on account of their bigotted and fervile attachment to every hypothefis of their mafter. The cry of herefy was inftantly renewed, and Galileo was again cited to appear before the tribunal of the inquifition in 1633.

At the age of 70 years this venerable philofopher was obliged to comply with the citation; and, on his arrival at Rome, he was committed prifoner to the apartments of the fifcal of the holy office. But at the interceffion of the grand-duke he was permitted to refide in the houfe of his ambaffador during the procefs that was carried on againft him. After a trial of about two months, he was brought to receive fentence in full congregation, and folemnly ordered to abjure and condemn the Copernican fyftem, as contrary to the Scriptures, and to bind himfelf by oath no longer to teach or fupport it, either directly or indirectly. As a punifhment for having difobeyed a former decree of the holy office, he was detained in prifon at the pleafure of the cardinal inquifitors, and enjoined, as a faving penance, for three years to come, to repeat, once a week, the feven penitential pfalms; the court referving to itfelf the power of moderating, changing, or taking away, wholly or in part, the above-mentioned punifhment and penance. His "Dialogues" were alfo cenfured, prohibited, and ordered to be burnt at Rome. The rigour of his fentence was afterwards confiderably abated by pope Urban VIII.; and he was at length, *viz.* in 1634, permitted to refide at his country-houfe at Arcetri, in the neighbourhood of Florence. Here he fpent the refidue of his days, profecuting his ftudies and obfervations, and communicating the refult of them occafionally to the public; and here he was vifited by perfons of the principal rank and character at Florence. Injured in his fight by the conftant ufe of his telefcope, and by the nocturnal air, he became blind about three years before his death; and this calamity, which he bore with philofophical fortitude, prevented his execution of feveral plans which he had in contemplation for the improvement of fcience and the benefit of the world. In 1642 he was feized with a diftemper which terminated his valuable life, in the 78th year of his age.

Galileo was of fmall ftature, venerable afpect, and vigorous conftitution; his learning was extenfive; the acutenefs of his wit, and the affability of his temper and manners, rendered him a pleafant companion. His chief paftimes were architecture, agriculture, drawing, painting, and mufic.

The light which Galileo caft upon natural philofophy by his aftronomical difcoveries and mechanical inventions and improvements, aided by his extenfive knowledge of mathematics, entitle him to rank in the firft clafs of mathematical philofophers. The following fketch of his difcoveries and improvements was drawn by Mr. Maclaurin, a highly competent judge, and we fhall therefore give it in his own words.

"He made the evidence of the Copernican fyftem more fenfible, when he fhewed from the phafes of Venus, like to the monthly phafes of the Moon, that Venus actually revolves about the fun. He proved the revolution of the fun on his axis, from his fpots; and thence the diurnal rotation of the earth became more credible. The four fatellites that attend Jupiter in his revolution about the fun, reprefented, in Jupiter's leffer fyftem, a juft image of the great folar fyftem; and rendered it more eafy to conceive how the moon might attend the earth, as a fatellite, in her annual revolution. By difcovering hills and cavities in the moon, and fpots in the fun conftantly varying, he fhewed that there was not fo great a difference between the celeftial and fublunary bodies as the philofophers had vainly imagined.

"He did no lefs fervice by treating, in a clear and geometrical manner, the doctrine of motion, which has been juftly called the key of nature. The rational part of mechanics had been fo much neglected, that there was hardly any improvement made in it, from the time of the incomparable Archimedes to that of Galileo; but this laft named author has given us fully the theory of equable motions, and of fuch as are uniformly accelerated or retarded, and of thefe two compounded together. He firft demonftrated, that the fpaces defcribed by heavy bodies, from the beginning of their defcent, are as the fquares of the times, and that a body, projected in any direction that is not perpendicular to the horizon, defcribes a parabola. Thefe were the beginnings of the doctrine of the motion of heavy bodies, which have been fince carried to fo great a height by fir Ifaac Newton."

In

In geometry Galileo has been allowed, on the beft authority, to be the inventor of the cycloid (fee CYCLOID): he alfo invented the fimple pendulum, and made ufe of it in his aftronomical experiments; he had alfo thoughts of applying it to clocks; but the honour of executing his defign was referved for his fon Vincenzio, who made the experiment in Venice in 1649; and the invention was afterwards carried to perfection by Huygens. (See CLOCK and PENDULUM.) Galileo alfo invented a machine with which the Venetians render their Laguna navigable.

This excellent philofopher "alfo difcovered the gravity of the air, and endeavoured to compare it with that of water, and opened up feveral other inquiries in natural philofophy. He was not efteemed and followed by philofophers only, but was honoured by perfons of the greateft diftinction of all nations."—"Galileo had fcholars worthy of fo great a mafter, by whom the gravitation of the atmofphere was eftablifhed fully, and its varying preffure accurately and conveniently meafured, by the column of quickfilver, of equal weight, fuftained by it in the barometrical tube. The elafticity of the air, by which it perpetually endeavours to expand itfelf, and, while it admits of condenfation, refifts in proportion to its denfity, was a phenomenon of a new kind, ("the common fluids," as it was then thought, having no fuch property,) and of the utmoft importance to philofophy. Thefe principles opened up a vaft field of new and ufeful knowledge, and explained a great variety of phenomena, which had been accounted for in an abfurd manner before that time. It feemed as if the air, the fluid in which men lived from the beginning, had been then firft difcovered. Philofophers were every where bufily inquiring into its various properties, and their effects; and valuable difcoveries rewarded their induftry. Of the great number who diftinguifhed themfelves on this occafion, we cannot but mention Torricelli in Italy, Pafchal in France, Otto Guerick in Germany, and Boyle in England."

The treatifes written by Galileo were fo numerous, that we fhould far exceed our prefcribed limits if we recited all their titles, and their refpective dates and places of publication. Thefe treatifes, together with others written by fome of his difciples in defence of his doctrines and obfervations, were collected and publifhed by Menoleffi, in 1656, under the title of "L'Opere de Galileo Galilei Lynceo, nobile Florentino, &c." in two volumes, 4to. A volume alfo of his "Letters" to feveral learned men, and folutions of a variety of problems, was publifhed at Bologna, in 4to. His laft difciple, Vincenzo Viviani, a very eminent mathematician, methodized a piece of his mafter's, and publifhed it under the title of "Quinto Libro de gli Elementi d'Euclide, &c." 1674, 4to.; and he alfo publifhed fome other pieces of Galileo's, including extracts from his letters to a learned Frenchman, in which the author gives an account of the works which he intended to have publifhed, and an extract of a "Letter to John Camillo," a mathematician of Naples, concerning the angle of contact. Many other of Galileo's writings were unfortunately loft to the world, through the fuperftition of one of his ignorant nephews; who, confidering that his uncle died a prifoner of the holy office, though permitted to refide in his own houfe, fufpected that his papers might contain dangerous herefies, and therefore committed them to the flames.

Befides the obligations which aftronomy, mathematics, and the general knowledge of nature, have had to this great man, which are well known; his inquiries into the propagation, properties, and ratios of found; difcovering the harmonic proportions into which a fingle ftring divides itfelf when founding; the fympathy of perfect confonance, in one ftring caufing another to found that is tuned in unifon, octave, or fifth, have been fo much the means of extending the knowledge of harmonics, by fubfequent writers, that this great philofopher as well merits an honourable niche among benefactors to the fcience, as his father Vincenzio Galilei, among thofe who have advanced the art of mufic by their labours. Galileo, in his "Difcorfi e Demonftrationi Matematiche," treats of the vibrations of ftrings, harmonies of kindred founds, propagation of found, and of mufical proportions. The dedication of thefe difcourfes to the Conte de Noailles, is dated 1638, four years before the author's death. (Opere del Galileo, in Bologna 1655, vol. ii. dial. 1mo. p. 74, et feq.) It has long been a received opinion, that Galileo was the natural fon of Vincenzio Galilei, a Florentine nobleman; but this opinion has lately been confuted by feveral Italian writers, particularly Signor Carlo Giuliani, who fent the late M. Diderot, one of the editors of the Encyclopedie, where the illegitimacy of Galileo is afferted, the neceffary documents to prove that this great philofopher, born at Pifa February 19th, 1564, was the legitimate offspring of Vincenzio Galilei and Giulia di Cofimo Ammanati di Pefcia, his true and lawful wife. See Elogj Italiani, tomo v. Moreri. Hutton's Mathematical Dictionary. Maclaurin's Account of Sir Ifaac Newton's Philofophical Difcoveries, b. i. c. 3. Brucker's Hiftory of Philofophy, by Enfield, vol. ii. b. x. c. 3. § 3. Gen. Biog.

GALILEO'S *Telefcope*. See TELESCOPE.

GALILEO'S *Temperament of the Mufical Scale*.—According to Mr. Overend's MS. in the library of the Royal Inftitution, vol. i. p. 135, this fcale had the fifth tempered $\frac{2}{7}$ths of a major comma flat, and the fourth as much fharp: the major third was $\frac{4}{7}$ths of a comma flat, and the minor fixth the fame quantity fharp: the minor third $\frac{6}{7}$ths of a comma fharp, and the major fixth as much flat: the major fecond or greater tone $\frac{4}{7}$ths of a comma flat, and the major feventh $\frac{10}{7}$ths of a comma flat. Such a fyftem as this feems very inapplicable to practice, to which perhaps it never was fubmitted, like numerous modern tuning fchemes.

GALINA POINT, in *Geography*, a cape on the north coaft of Jamaica. N. lat. 18° 26'. W. long. 76° 41'.

GALINAZZO, a town of Italy, in the department of the Mela; 12 miles N. of Brefcia.

GALINGA, a town of Italy, in the department of the Serio; 16 miles E. of Bergamo.

GALINGEN, a town of Pruffia, in the province of Natangen; 7 miles S. of Bartenftein.

GALINHAS, called by the Portuguefe Magualbari, a river of Africa, which runs into the Atlantic. N. lat. 7° 5'. W. long. 11° 15'.

GALIOLA, a fmall ifland in the gulf of Venice, S.W. of Cherfo. N. lat. 44° 54'. E. long. 14° 20'.

GALIOTE *à Bombes*, Fr. See BOMB-*veffels*.

GALIPÆA, in *Botany*, a barbarous name formed by Aublet out of the French appellation of the Caribée Indians, Galipons, who call the plant in queftion *Inga*. Aublet. Guian. 662. t. 269. Willd. Sp. Pl. v. 1. 41. Juff. 418. Lamarck Illuftr. t. 10. Clafs and order, *Diandria Monogynia*. Nat. Ord. uncertain, Juff.

Gen. Ch. *Cal.* Perianth inferior, of one leaf, tubular, with four or five angles, and as many acute equal teeth. *Cor.* of one petal, longer, regular; tube fhort, inferted into a glandular receptacle; limb in four or five deep, oblong, acute, nearly equal fegments. *Stam.* Filaments four, two of which are fhort and abortive; two as long as the calyx; all inferted into the tube of the corolla; anthers oblong, obtufe, of two lobes and two cells. *Pift.* Germen fuperior,

fuperior, roundifh, with four or five angles ; ftyle thread-fhaped, as long as the ftamens ; ftigma blunt, four-lobed. *Fruit* unknown.

Eff. Ch. Calyx inferior, tubular, four or five-cleft. Corolla tubular ; limb in five deep fpreading fegments. Two ftamens abortive. Germen fuperior, angular.

1. G. *trifoliata*, the only fpecies, is a native of the fhores of rivers in Guiana. A *fhrub* four or five feet high. *Leaves* alternate, ftalked, ternate ; leaflets equal, elliptic-oblong, pointed, entire, fmooth, their veins united in a marginal rib. *Flowers* terminal, corymbofe, fmall, greenifh. It feems moft akin to the order of *Vitices*.

GALISANO, Cape, in *Geography*, a cape on the N. coaft of Spain. N. lat. 43° 28′. W. long. 30° 40′.

GALISPA, a town on the E. coaft of the ifland of Gilolo. N. lat. 2° 4′. E. long. 127° 50′.

GALISTEO, a town of Spain, in Eftramadura ; 10 miles E. of Coria.

GALITSCH, a town and diftrict of Ruffia, in the government of Koftroma, on the S. fide of a lake of the fame name ; 56 miles E.N.E. of Koftrom. N. lat. 57° 56′. E. long. 60° 40′. The lake is about 50 miles in circumference, and communicates with the river Koftroma by the fmall rivulet Vara.

GALIUM, in *Botany*, γαλιον of Diofcorides, from γαλα, *milk*, becaufe the ancients believed it to have the power of curdling that fluid. This is denied by Bergius, Krocker, and Martyn. It is very probable that plants of this genus may, in a paftoral ftate of fociety, have ferved as ftrainers for milk, and poffibly G. *verum*, which is the precife γαλιον of Greek writers, may, on account of its yellow flowers, have been thought to communicate a richer colour to it in confequence. Matthiolus fays this plant makes the milk fweeter. Ladies' Bed-ftraw. Linn. Gen. 52. Schreb. 69. Willd. Sp. Pl. v. 1. 584. Mart. Mill. Dict. v. 2. Sm. Fl. Brit. 173. Prod. Fl. Græc. v. 1. 90. Juff. 196. Lamarck Illuftr. t. 60. Gærtn. t. 24. Clafs and order, *Tetrandria Monogynia*. Nat. Ord. *Stellatæ*, Linn. *Rubiaceæ*, Juff.

Gen. Ch. *Cal.* Perianth fuperior, minute, of four equal teeth ; fometimes wanting. *Cor.* of one petal, wheel-fhaped, deeply four-cleft, acute ; tube fcarcely any. *Stam.* Filaments four, awl-fhaped, inferted into the corolla, fhorter than the fegments ; anthers fimple. *Pift.* Germen of two grains ; ftyle thread-fhaped, cloven half-way down, as long as the ftamens ; ftigmas globofe. *Peric.* Two dry, cohering, globofe berries. *Seeds* folitary, large, kidney-fhaped.

Eff. Ch. Corolla of one petal, flat, fuperior, feeds two, roundifh.

Obf. Tournefort divided his genus *Aparine* from *Galium*, or, as he writes it, *Gallium*, on account of the roughnefs of the fruit in the former ; but this is fo far from a good generic diftinction, that it proves, in fome cafes, not a permanent fpecific difference, at leaft fo far as hairinefs is concerned. Several fpecies differ permanently in the kind of roughnefs which cover their fruit. The genus, however, ftill ftands divided in books into fpecies with a fmooth fruit, and others with a hairy or briftly one. Perhaps a better diftinction would be between an even and a tuberculated fruit.

The habit of this genus is very flender ; the ftems herbaceous, acutely quadrangular, oppofitely branched, very brittle, except the central woody part, which is tough and elaftic. Leaves whorled, from four to eight or more in each whorl, linear inclining to obovate, rarely elliptical, never ovate ; their margins entire, often revolute. The angles of the ftem, and ribs, edges, and furfaces of the leaves, are often befet with hooked prickles, and very excellent fpecific marks are fometimes to be difcovered in the different directions of thefe prickles on the feveral parts of the leaf. The root is fmall, either fibrous or creeping, in moft inftances perennial, fometimes red like Madder. Flowers white, yellowifh, or dull red, in terminal, forked, occafionally axillary, panicles or tufts. Corolla fometimes awned.—Willdenow diftinguifhes 50 fpecies of *Galium*. In the Prodromus Fl. Græcæ are 21, comprehending ten new ones not known to Willdenow. The Flora Britannica has thirteen, all of which are figured in Engl. Bot. except G. *Witheringii* ; and to which is to be added G. *Spurium* of Linnæus, Engl. Bot. t. 1871, recently found in Scotland by Mr. George Don. The genus is principally European.

The Galium Aparine is common in cultivated ground and hedges, producing its flowers from June till September. This fucculent plant has no fmell, but to the tafte it is bitterifh, and fomewhat acrid. Diofcorides mentions an ointment made of the bruifed herb, mixed with lard, as an ufeful application to difcufs ftrumous fwellings ; and Gafpari, an Italian, fuccefsfully adopted a fimilar practice. He alfo informs us, that a decoction of the plant, employed as a fomentation, was found very efficacious in fwellings of the glands of the neck, which followed a certain epidemic at Verona.

Dr. Cullen, however, tried the aparine in glandular indurations without advantage. Mayerne fays, that three ounces of the juice of the plant, taken twice a day in wine, were experienced to be an ufeful aperient and diuretic in incipient dropfies. But the character, in which the aparine has of late been chiefly efteemed, is that of an antifcorbutic ; for which purpofe a tea-cup full of its expreffed juice is to be taken every morning for nine or ten days. When the dried plant cannot be procured, it may be ufed in a dried ftate as tea.

Other fpecies of Galium have been ufed medicinally, efpecially the G. verum, or yellow lady's bed-ftraw, the flowers of which have been recommended in hyfteric and epileptic complaints. Thefe flowers, as fome have afferted, contain an acid which coagulates milk ; but neither Bergius, Cullen, nor Young, obferved this effect, after repeated trials. Woodville's Mat. Med.

GALL. See Liver.

Gall, in the *Materia Medica*. The depurated liquor of gall has been efteemed one of the greateft of all remedies for freckles in the face : the manner of ufing it is this ; mix together equal parts of it, and of oil of tartar per deliquium : to a dram and a half of each of thefe, add an ounce of river water, mix them well by fhaking, and keep them in a vial well ftopped : the end of the finger being wetted with this, is to be touched upon the freckled part, and this repeated three or four times a day, letting it dry on ; at length the part will look red, and there will be a fort of tickling fenfation felt in it ; and after that, the fkin will become fcurfy, and both that and the freckles will fall off. If this does not fucceed the firft time, it is to be repeated, and it will clear the face for fix or eight months, at the end of which time it is to be ufed again. Mem. Acad. Par. 1709.

The gall of divers animals has been recommended for divers ufes, but moft of thefe are now reckoned fabulous and unfounded.

With us thefe fluids are employed only for external purpofes ; a mixture of ox-gall with camphorated fpirit of wine is faid to be an ufeful embrocation for fprains, bruifes, rheumatic pains, &c.

Gall-*bladder*. See Liver.

Gall-

GALL-*bag of birds*. See *Anatomy of* BIRDS.

GALL-*ficknefs*. See FEVER.

GALL-*ftones*. See BILIARY *Calculi*.

GALL, in *Mining*, is one of the many names for a *fault*, which fee.

GALLS, in *Vegetable Phyfiology*, are morbid excrefcences, originating from the moft vigoroufly growing parts of plants, in confequence of the attacks of infects, chiefly of the Hymenopterous order, and of the genus *Cynips*. The parent infect is provided with a fharp fting, ferving to perforate the branch, leaf, or bud, in which its egg is to be depofited, and in fome cafes the puncture made is very deep. As foon as the egg is hatched, the young larva or maggot, ftimulating the vital principle of the plant, caufes the part in which it is lodged to affume a great degree of luxuriance, difplayed in various whimfical excrefcences, foreign to the nature of the plant in itfelf, but each appropriated to the particular kind of infect from whofe operations it fprings. The original perforation is foon clofed up and entirely obliterated. At length, the maggot having fed on the juices of the plant, copioufly directed to the injured part, undergoes its changes to a chryfalis, and, finally, to a winged fly, like its parent, when it immediately efcapes from its confinement by a frefh perforation, and the gall, being left empty, foon dries or hardens. The main ftems of fome of the large fhrubby kinds of Hawkweed, *Hieracium fabaudum* and *umbellatum*, are often thus ftung, and fwell into oval knots, in which, while growing, young infects may be found latent. The two Britifh fpecies of Oak bear feveral different kinds of Gall, as the light fpongy bodies vulgarly named oak apples, growing from the ftalks of the leaf or flower, or from the young twigs; and a red juicy berry-like excrefcence, refembling a cranberry, from the leaves, which is well figured, with its infect inhabitant, in Roefel's work on the transformations of that tribe of animals. The aftringent galls brought from the Levant for the purpofes of dyeing and making ink are the produce of an oak, whofe fpecies is not very clear to us, nor have we ever had an opportunity of feeing this fort of gall, ufually termed the Aleppo Gall, in a recent ftate, but its natural hiftory is well explained, with a plate, in Olivier's Travels. Mr. Arthur Aikin, in his valuable Dictionary of Chemiftry, charges naturalifts in general with having, without enquiry, taken up fuperficial and erroneous ideas of Galls, and particularly of this Aleppo kind, which latter he feems inclined to prove a fort of feed-veffel. He probably had not feen the work of Olivier, which fhews it to be the excrefcence of an oak, and confequently quite independent of the true and indubitable feed of that tree, the acorn; nor, from the wide and indifcriminate cenfure thrown by Mr. Aikin on naturalifts in general relative to this fubject, can he have perufed the pages of Reaumur, Roefel, and others, which are models of clear and practical information refpecting the origin, growth, and appearance of various fimilar productions. What may have mifled the judgment of this acute and liberal writer in the dried Aleppo galls, we have not at prefent materials to determine: nor ought much ftrefs to be laid on the appearances of bodies in fo unnatural a ftate, whether they may have fuffered merely from keeping, or whether, as we have fome fufpicion, they may occafionally have undergone the operation of baking. In either cafe the appearance and condition of the young animal within may well be altered; nor is it any objection to the prevailing theory of its introduction into the plant, that the original perforation, made by the parent in laying the egg, is no longer to be traced. So great a change in the neighbouring parts takes place, that this perforation is very foon obliterated in all the common galls that we have examined.—Several galls are found on Willow and Poplar leaves; but the moft remarkable excrefcence of this kind is the Bedeguar, or moffy ball found on the Dog-rofe of our hedges, each fpecimen of which lodges internally numerous maggots of the *Cynips Rofæ*, which, when they arrive at their winged ftate, eat their way out. After this, and not before, various perforations may be found in the Bedeguar, which foon afterwards withers and dries. Analogous to this fort of Gall, is one obferved by the writer of the prefent article on Willows in Provence, which branches out like a mofs, or tufted Lichen. Nor is the rofaceous expanfion at the end of each branch of the Rofe Willow, *Salix Helix*, at all different in nature, though unlike in fhape. Both thefe laft-defcribed are permanent, though withered, on the twigs, long after all the proper leaves are fallen. More akin to the galls of the Oak are thofe of feveral Sages in the Levant, *Salvia pomifera*, *triloba*, and *officinalis*, which refemble little apples, and are fold in the markets of Crete in particular, being efteemed a delicacy when prepared with fugar. It is remarkable that the production of galls caufes fuch a change in the fecretions of the parent plant in thofe parts, as always tends to the generation of acetous acid, or more efpecially of the aftringent or tanning principle. Their colour is confequently more tinged with red than the neighbouring parts; at leaft this appears in the Bedeguar, the fmall galls on willow and oak leaves, and more or lefs in many other inftances. Some bodies of the nature of galls lodge in one common cavity a multitude of growing infects, witnefs thofe remarkable ones, as big as the finger, found in the fouth of Europe on the Maftic-tree, *Piftacia Lentifcus*. Thefe are very red, of a coriaceous texture, and fwarm internally with the *Aphis Piftaciæ* of Linnæus. The red fwellings on a peach or nectarine leaf, though they have no cavity fhut up from the external air, as we believe, is completely the cafe with thofe of the Maftic, bear a confiderable affinity to galls, the leaf being greatly difeafed, tumid, difcoloured, and fwarming with *Aphides*, whofe ftimulating action appears to caufe its morbid ftate. S.

Galls, with regard to their medicinal ufe, are found to be very aftringent, and good under proper management in diarrhœas, dyfenteries, and hæmorrhages of all kinds; and applicable to the fame indications as the oak-bark. They have alfo a great virtue as a febrifuge, and are often found to cure an intermittent. Their efficacy in intermittent fevers was tried by Mr. Poupart, by order of the Academy of Sciences, and from his report it appears, that the galls fucceeded in many cafes; and alfo that they failed in many other cafes, which were afterwards cured by the Peruvian bark. (Mem. pour l'An. 1702.) In fevers half a dram or more of the powder of Aleppo galls may be given for a dofe. They are alfo ufed externally as a ftrengthener and aftringent: a decoction of them is applied with fuccefs by way of fomentation in *procidentiæ of the anus*, and has been injected in the fluor albus with great fuccefs. As they poffefs a greater degree of aftringent and ftyptic power than the oak-bark, they feem to have an advantage over it, and to be better fuited for external ufe. Reduced to fine powder, and made into an ointment, they have been found of great fervice in hæmorrhoidal affections. Cullen, Mat. Med. vol. ii.

Galls may be made a very ufeful teft for iron in the feveral fpecies of vitriols; for it is certain that an infufion of galls will become black with a folution of any vitriol that contains iron, and not at all fo with fuch as contain only copper, as the common blue vitriol and the like.

Dr. Lewis obferves, that if a decoction or infufion of galls

galls is dropt into a folution of this vitriol largely diluted with water, the firft drops produce blueifh or purplifh red clouds, which mingling with the liquor, tinge it uniformly of their own blueifh or reddifh colour. With diftilled water, or the common fpring waters, the mixture is always blue; but if the fmalleft portion of alkaline falt be diffolved in the water, or if the water is in the leaft degree putrid, the colour produced will be purple or reddifh. If more of the aftringent infufion be added to the blue or purple liquors, they will deepen to a black, which will be more or lefs intenfe according to the degree of dilution: and the colouring matter may be feparated from the liquors, unlefs they are of a full blacknefs, by dilution with water and depofition. The feparation may be retarded or prevented, as is done in the preparation of ink, by adding fome mucilaginous matter, as gum arabic. This coloured matter is evidently a ferruginous precipitate; for, although it cannot be attracted by a magnet, this property may be given to it by a flight calcination. This precipitate is foluble by acids, as in the cafe of inks, whofe colour is hereby deftroyed, but it may be reftored by the addition of alkalies. Lewis's Com. Phil. Techn. p 344, &c. See the next article.

Gall-*nut*, in *Chemiftry*.—Of the great variety of gall-nuts, two in particular are well known as extenfive articles of commerce, *viz.* the common, and the Aleppo gall-nut. The former is brought from the fouthern parts of Europe, and the latter from Afia Minor and particularly Syria, and both are the produce of the prickly-cupped oak. (Quercus cerris, Linn.) Thefe two alone have engaged the attention of chemifts. We fhall preface the refults of their enquiries with a defcription of the gall-nut itfelf of each kind, extracted principally from Aikin's Chem. Dictionary.

The Aleppo gall-nut is a round body of an olive green colour. It is hard and heavy, and frequently exhibits fmall protuberances on its furface. When broken it is found to confift of four diftinct parts, which admit of being feparated. The external, or cortical covering, is of a clofe fibrous texture and very thin; it is highly aftringent to the tafte. The part that immediately follows is very fimilar to refin, both in its fracture and luftre; its colour is dark yellowifh brown, it is very brittle, and its tafte is naufeoufly aftringent and bitter; on a red hot iron it becomes black, exhales a peculiar odour in great abundance, confumes without flame like the cortical covering, and leaves a little afhes. It is bounded on the interior by a pale yellowifh brown fhell, which has many of the properties of ligneous fibre. This fhell enclofes, when the gall-nut is found, an oval kernel of about a quarter of an inch in length, of a brown cream colour, or if mouldy, of a bright chocolate; it is infipid unlefs chewed, then a faint fweetifh flavour is perceived, which has been compared to that of a bad almond.

The common gall-nut differs confiderably from the preceding, and is eafily diftinguifhed. It is of a yellowifh colour, not fo heavy as the Aleppo gall, nor poffeffed of the fame refinous fracture, it is alfo larger, being about the fize of a nutmeg, lefs aftringent, and not capable of making equally good infufions with water, on which account it is much lefs valued.

For our chemical knowledge of the gall-nut, we are principally indebted to the labours of Scheele, Deyeux, Seguin, Prouft, and Davy. Scheele difcovered that the gall-nut contains gallic acid; M. Deyeux, in an elaborate memoir, pointed out the effects of a variety of re-agents on the infufion, and fhewed that it contained extractive matter. M. Seguin afcertained the exiftence of tannin, as a peculiar principle, and found that it entered into the compofition of the gall-nut; Mr. Prouft made known feveral curious particulars on the mode of feparating the tannin from the other ingredients of this fubftance, &c. And Mr. Davy greatly increafed the general ftock of information, to which other chemifts have likewife contributed, by many additional new facts, and by minutely examining thofe before made public.

The chemical hiftory of the gall-nut is fo intimately connected with that of tannin, that to treat the fubject at full length, would be to break in upon the latter article, which being of more importance requires to be more fully difcuffed; we fhall therefore only defcribe the general properties of the fubftance in queftion, and refer our readers for farther information to the article Tannin.

Pounded gall-nuts treated with water form a deep brown coloured infufion; feveral portions of water are neceffary to exhauft all the foluble matter, and what remains after the water ceafes to act appears very analogous to woody fibre. The laft infufions obtained, though apparently they poffefs the fame properties as the firft, differing only in degree, frequently have a green colour. This colour, which is attributed to the prefence of gallat of lime, is deftroyed by the nitric and oxy-muriatic acid, and is changed into red by the addition of a few drops of fulphuric acid. On account of the variable proportions of the foluble matter in different gall-nuts, there is fome difficulty in making uniform infufions; the beft method is to macerate the gall-nuts, finely powdered, in ten times their weight of cold water, for 24 hours. Infufions made with boiling water are generally turbid, and therefore unfit for delicate experiments. The fufpended matter that occafions this turbidnefs cannot be feparated by frequent filtrations, but in time it gradually fubfides and leaves the infufion tranfparent. The ftrongeft infufion that can be made at 56° Fahrenheit, is of the fp. gr. 1.068. It is of a yellowifh brown colour, and femi-tranfparent. To the tafte it is exceffively aftringent, and it ftrongly reddens vegetable blues. Alcohol, when added to it, occafions no precipitate, but fometimes a flight turbidnefs; hence it may be inferred that little or no mucilage is prefent. The red fulphat of iron gives a deep black precipitate indicating the prefence of gallic acid; a folution of gelatine forms a copious precipitate indicating tannin; and muriat of alumine and oxymuriat of tin throw down a precipitate which, it is generally conceived, denotes extract. From this knowledge of the component parts of the infufion, it is eafy to conceive its effects on re-agents, and the facts which have been difcovered refpecting its agency will agree with this compofition. Thus, as it might be inferred, a precipitate is produced in the infufion by the fulphuric, muriatic, and dilute nitric acids, and a decompofition without a precipitate by the oxymuriatic acid and concentrated nitric acid. The cauftic alkalies render the infufion of a brownifh red colour; but in their carbonated ftates they produce immediate precipitates. The alkaline earths, either pure or in combination with carbonic acid, feparate moft of the conftituent parts of the infufion, forming compounds poffeffed of little folubility; magnefia and alumine have the fame effect; but the refults in all thefe inftances greatly depend on the proportions ufed, and the time allowed for the refult; when the earths are in large quantities, they feparate almoft the whole of the tannin, gallic acid, and extract, but when their quantity is fmall, the principal part of the gallic acid remains in folution, combined with part of the earth employed, forming a fuper-gallat. Generally either the folid compound formed, or the fuper-natant liquor is of a green colour, and the latter does not precipitate gelatine, unlefs an excefs of acid be prefent. The oxyd of zinc and tin, when boiled in the infufion, renders the water pure. Several neutral falts occafion a precipitate, when

added feparately to the infufion. This effect is produced by fulphat of lime and alumine, by nitrat and acetite of potafh, and by muriat of foda and barytes. Thefe compounds are to a certain extent foluble in water, and their folutions precipitate gelatine. Mr. Davy conceives that they contain, befides tannin, a portion of gallic acid, and extract in union with part of the falt itfelf. He is of opinion, too, that the precipitates which moft metallic falts afford with an infufion of galls, are of a fimilar nature.

When the infufion is flowly evaporated it becomes turbid, and depofits a matter fimilar to extract, which may be moulded when warm like wax, but when cold is brittle. It is remarkable, that if a frefh infufion is made with the refidue evaporated to drynefs, this infufion on a fecond evaporation depofits more extract, and if the treatment is feveral times repeated, the fame effect is produced.

When gall-nuts are diftilled with water, at a heat below its boiling temperature, the water comes over pure; but when the temperature is raifed a little above 212°, a liquor is received that contains, befides a fmall portion of gallic acid, a confiderable quantity of acetic.

When gall-nuts are diftilled in a retort at a temperature very flowly raifed from 212° to a red heat, carbonic acid in great abundance is conftantly produced; the firft fluid that condenfes in the receiver contains much gallic acid; the next product is fublimed gallic acid; and the laft is a liquor, which is a mixture of a lemon coloured fluid, of a light oil of the fame colour, and of a heavy empyreumatic oil. The laft portions of carbonic acid gas are mixed with carburetted hydrogen. The refidual coal is very black and retains ftill, imperfectly, the form of the galls.

When the diftillation is carried on with a heat more rapidly raifed, the refults are very different. A much larger quantity of carbonic acid gas is evolved, no gallic acid fublimes, the liquid products are more coloured, and the carburetted hydrogen is produced in greater plenty.

Refpecting the compofition of the gall-nut, different opinions are entertained; that adopted by the moft approved writers is, that it is a compound of tannin, gallic acid, mucilage, extract, and an infoluble matter, fimilar to woody fibre. It is certain that the fubftances, to which thefe names have been applied, can be extracted from the gall-nut; but the exiftence of thefe fubftances themfelves, as peculiar principles, has lately been queftioned. Thus M. Bouillon La Grange confiders gallic acid as a combination of acetic acid and tannin. M. Thenard maintains that tannin is a compound of gallic acid and vegetable matter; and Dr. Boftock and Mr. Murray are doubtful refpecting the propriety of admitting tannin and extract as two diftinct principles. We fhall not here enter into a difcuffion of thefe gentlemen's views; the two firft, for the prefent, may be oppofed to each other, and the juftnefs of all of them can only be determined by future experiments. The ultimate parts of the gall-nut are the fame as thofe of all other vegetable fubftances; *viz.* carbon, oxygen, and hydrogen; the earths, which it fometimes contains, appear to be adventitious, and to depend on the nature of the foil on which the nut-gall is produced.

For the only analyfis of the gall-nut we are indebted to Mr. Davy. He found that 500 grains contain 185 grains of foluble matter, which were compofed of

Tannin - - - - - - - - -	130 grs.
Mucilage, rendered infoluble by evaporation -	12
Gallic acid and a little extract - - - -	31
Remainder, lime and faline matter - - -	12
	185

For the ufes of the gall-nut, fee the articles Dyeing and Ink. Annales de Chimie, tom. xvii. p. 1, and tom. lx. p. 173. Philofophical Tranfactions, 1803, p. 239.

Theophraftus, Diofcorides, Pliny, and other writers of antiquity, mention the gall-nuts of Syria as being of fuperior quality, and ftill at the prefent day thofe that are brought from the Eaft are preferred to all the reft. The principal places from which this valuable article of trade is exported to Europe, are Aleppo, Tripoli, Smyrna, and Said; particularly the firft of thefe places, to which the gall-nuts are brought from Moful, fituated on the weftern bank of the Tigris, about 10 days' journey from Aleppo. The real Moful gall-nuts are unqueftionably the beft of all; but, according to Dapper, all thofe gathered farther in the interior of the country, near the river Tigris, and towards Perfia, near Sahrozour, Gibel, Summanfu, and Serty, are equally known by the name of Moful gall-nuts. The trade of this article is entirely in the hands of the Curdes, who refort to Aleppo from September to May. Thefe gall-nuts that come lateft are generally fuppofed the beft. An inferior kind is that fold at Said; but of the worft quality are thofe which are carried from Caramania to Cyprus.—The Levant gall-nuts differ from thofe of Europe in being on the whole fmaller, much more compact and heavy, in having a more tubercular, and almoft prickly furface, and in their blackifh colour, which often fhows a tinge of greenifh or bluifh. Thofe that are light-coloured, yellowifh, and whitifh, which is not feldom the cafe with thofe of Cyprus, are held in little eftimation; they contain lefs aftringent matter; as is faid to be likewife the cafe with thofe furnifhed with a hole, and which were gathered after the infect had pierced through its inclofure.

The reafon why the Levant gall-nuts are of fuperior quality to the European does not appear to be well underftood. Perhaps the infect which produces them is a fpecies of cynips different from ours; perhaps, too, the warmth of the climate of the eaftern countries promotes the concoction of the fpecific juice, which is fecreted after the puncture made by the infect. Several authors have fuppofed that the Levant gall-nuts are produced by an oak fpecifically different from ours: according to Bergius, Cullen, and Murray, it is *Quercus Cerris;* while others have thought *Q. Ægylops* to be the fpecies. It is, however, well known, that both thefe fpecies are alfo found in Spain and in fome parts of the fouth of Europe.

The bluifh gall-nuts are the higheft in price, and next to them thofe of a greenifh colour from Smyrna. The whitifh fort is the cheapeft; a circumftance of which impoftors avail themfelves to increafe their value by dyeing them blue. The deceit is, however, detected by the deeper tinge of blue of thefe artificial productions, as well as by the hole which is generally found in the white fort.

A particular kind of gall-nuts is known in Germany by the name of *knoppern* or *knobben*, of which an account has been lately given by profeffor Beckmann. They are probably not unknown in this country; but we have not been able to learn by what name they pafs among the traders in this merchandize. They are not, like the common gall-nuts, nearly globular, but irregularly angular and amorphous, and are larger, and more compact than even the Aleppo nuts. The beft are faid to come from Natolia; and Beckmann fuppofes that thefe are mentioned by writers under the Turkifh name of *bazgende,* and as now and then occurring among the gall-nuts from Aleppo. The eaftern nations, excelling in the arts of tanning and dyeing, ufe them, for both thefe purpofes, in preference to the real gall-nuts, which are far inferior in ftrength. From the Levant they found their way into Italy, and from thence to Vienna. Afterwards, when, on

account of the great demand for this article, it roſe conſiderably in price, and ſubſtitutes were accordingly ſought after, it appeared that the ſame *knoppern* were likewiſe found in abundance in the extenſive oak-foreſts of Hungary, Moravia, Croatia, and particularly of Sclavonia. Formerly, the farmers and foreſters of thoſe countries, who principally ſubſiſted by the breeding of hogs in their foreſts, were wont to conſider the frequent occurrence of thoſe excreſcences as a calamity, ſince, when they appeared in abundance, the crop of acorns was conſiderably diminiſhed; but they ſoon found that the profits ariſing from the ſale of this new article of trade far ſurpaſſed that derived from the acorns, for which neceſſity ſoon pointed out a ſubſtitute. In the year 1774, the juſt-mentioned provinces obtained permiſſion to export this article by ſea to the Auſtrian harbours in the Mediterranean. Since that time, the price of the knoppern has been fluctuating. In 1780, the kübel, being two Preſburgh buſhels, ſold for 17 florins; but ſoon after it fell to five and two florins the buſhel; and in 1783, the price was as low as from four to ſix groſchen a buſhel. In Hungary, they are found moſt abundantly in the Bakony foreſt, and the principal market for them is Fünfkirchen. Before they are uſed, the knoppern are pounded in fulling-mills.

When this new article of commerce was firſt diſcovered, it was generally ſuppoſed to be the work of the ſame inſect which produces the gall-nuts, but the oak was conſidered as a different ſpecies. Later obſervations, however, have proved that there is no difference in the oak, which is the common ſummer oak with elongated pedicles. What is equally certain is, that the inſect from which the knoppern originate is a diſtinct ſpecies of cynips: it depoſits its eggs in the germen or young fruits, and by this means an excreſcence is formed, which often covers the whole cup and acorn. Owing to the preſſure thus cauſed, the fruit is generally prevented from developing itſelf, and therefore remains in a dwarfiſh ſtate.

As a ſubſtitute for gall-nuts, the ancients, as appears from Paulus Ægineta, made uſe of the cups of acorns as well for the purpoſes of medicine as for tanning: and they are ſtill uſed in Italy, from whence, in latter times, they have found their way into Germany and France. They are imported from the Greek iſlands, Chios, Zia, Cyprus, and Samos, (which latter, on account of its oak-foreſts, was formerly called Δρύοσσα), but particularly from Smyrna, and the neighbouring ſmall harbours of Vourla and Segigiek, from whence alone 50,000 cwt. are ſaid to have been annually exported to Venice and Ancona. When, in 1779, the knoppern failed, a merchant of Vienna cauſed upwards of 1200 cwt. of acorn cups to be ſent from Smyrna, which he ſold with great advantage. Theſe cups, and the acorns they contain, are the largeſt of any we know; the former are about two inches in diameter, are woolly within, and furniſhed with woody ſcales on the external ſurface. The acorns are about two inches long, and almoſt entirely encloſed by the cup, ſo that the top only is viſible, which exhibits a kind of depreſſed umbilicus. The ſpecies of oak which furniſhes theſe cups is, according to the beſt accounts we poſſeſs, *Quercus ægylops*: the modern Greek denomination is *Velani*, a corruption of the Βαλανος of the ancient Greeks; whence Labat is miſtaken in deriving this name from that of Valone, a place on the eaſtern coaſt of the Adriatic, where this oak is ſaid to be found in abundance.

Galls, *Box*, in *Natural Hiſtory*, the name given by authors to a very ſingular kind of galls, of a conic figure, with a conic top, or cover reſembling a wooden box, and encloſing a white worm in the manner of the other vegetable lodgments of the ſame kind; this ſort of gall is found only on the leaves of the lime-tree. Reaumur.

Galls, *Bramble*, a ſpecies of galls found on the branches of the common wild bramble. Theſe are often no other than tumefactions of the ſtalk, for the ſpace of an inch, or thereabout, which ſometimes form only ſo many thick cylindric pieces; at other times they are of the ſhape of an olive, and ſometimes they affect only one ſide of the branch: in all caſes, however, the tumid part, or gall, is much harder than the other parts of the branch, which are in their natural ſtate. They are inhabited by a great number of worms of an oblong figure, and yellow colour, which have a ſharp point of a brown colour, and of the hardneſs of iron, proceeding from the extremity of the head, with which they tear and break the woody fibres, and near its end there is a ſlit, which is the mouth of the creature, and ſerves for receiving and conveying into the ſtomach the fragments of wood which it breaks with the point. Reaumur.

Galls, *Broom*, a ſpecies of galls found on the Geniſta vulgaris, or common broom. This gall is found to contain a ſmall oblong worm, of a red colour; and too ſmall to be ſeen diſtinctly without a glaſs.

Galls, *Lime*. See Lime.

Galls, *Muſhroom*. See Mushroom.

Galls, *Gooſeberry*. See Gooseberry.

Galls, *Grape*. See Grape.

Galls, *Roſe*. See Rose and Galls.

Galls, *Willow*. See Willow.

Gall, *Wind*. See Wind.

Gall-*inſect*, in *Natural Hiſtory*, the name of a claſs of inſects, ſo called from their reſemblance to ſmall galls or vegetable protuberances of a like kind upon trees. They are indeed ſo like theſe ſubſtances, as to have been by many miſtaken for them, and thought not of the animal, but of the vegetable kingdom. Theſe inſects paſs a very great part of their life, even many months together, faſtened againſt the leaves and ſtalks of plants, without any appearance of life or motion, and this is the time in which they acquire their ſtated growth. They are in this ſtate as immoveable as the branch they are fixed on, and ſeem to make a part of it. Their exterior form is remarkably plain and ſimple, and the more the creature increaſes in growth, the leſs appearance of life it ſhews; and even when it has acquired its maturity, and is in a condition to depoſit its eggs for the propagation of its ſpecies, it then appears leaſt of all of an animal form, and more, than in any other ſtate, reſembles a gall, or ſuch vegetable protuberance. Not only the vulgar and incurious have been deceived by this appearance, but the accurate count Marſigli, among others, after very attentively examining the gall-inſects of one ſpecies, remained ſeemingly convinced that they were real vegetable excreſcences. (See Cynips.)

They are uſually found on the ſtalks and branches of trees, ſhrubs, and perennial plants. They are very various in ſize, ſhape, and colour.

Theſe creatures have ſo little to attract the obſervation even of the curious, that they might probably have remained much longer unregarded, were it not that they multiply ſo exceſſively faſt on ſome fruit-trees. The peach-trees, in particular, are ſometimes in a manner covered with them, and theſe of more than one ſpecies; ſome of the globular kind, and others of the boat figure. The branches thus covered look rough and ſcabby, and the gardeners, ſenſible that whatever the things were, they muſt be nouriſhed at the expence of the juices of the tree, have attempted to deſtroy them. The leaves and fruit of theſe trees are often blackened by the wet that has run off from theſe inſects; and our orange-trees, which are frequently full of them, firſt ſtirred up the attention of the more careful obſervers of them to clear them away: theſe are principally of that kind,

 whoſe

whofe form is that of the inverted boat. Meffrs. de la Hire and Sedilieau were at the pains of making a fet of obfervations of a very curious kind concerning them; thefe gentlemen call this fpecies the orange-tree-bug, a name by which the gardeners alfo call them, though they have nothing in common with any known fpecies of that animal. See the Memoirs of the Academy of Paris, 1692. If many of the fpecies of thefe little animals, however, do mifchief to our fruit-trees, there are fome other kinds of them, the value and ufe of which may very well make us amends; fince it is from one fpecies of thefe little creatures that the inhabitants of many places make fuch great gains, gathering a harveft of them without the trouble or expence of fowing or cultivating. The kermes, fo well known by name, though fo little truly underftood, is of this kind, to which both the phyfician and the dyer are fo greatly obliged. Reaumur's Hift. Infects, vol. iv. p. 1.

Dr. Lifter was, perhaps, the firft difcoverer of the gall-infect and progal infect claffes: he found thefe animals on the plum, cherry, vine, laurel, and many other trees, and calls them *patellæ* of thefe trees. He was well apprized of their animal origin, and in the year 1671 difcovered that fome of them would ftrike a carnation-red colour, with ley of afhes, which was not only a good but a permanent tinge. The principal kind of which he made the experiment was the femiglobular fort, which he defcribes as being entirely round, except when they are applied to the tree. They were of the fize of half a large pea, of a chefnut colour, and of a fhining furface, faftening themfelves to the bark of the tree, as the limpets do to the rocks, and were generally fought after by ants and other vermin.

Gall, *Peach-infect.* See Peach.

Gall, *Shell-infect.* See Shell.

Gall, *Vine-infect.* See Vine.

Gall-*infect fly*, the male of the gall-infect fpecies. It is a two-winged fly of a very particular kind. There feems a great refemblance between thefe flies in all the gall-infect clafs, and that of the peach-gall-infect may give a proper idea of all the reft. This little creature, examined with the help even of the beft glaffes, fhews, on the under part of its head, nothing analogous to the organs of other flies, deftined to convey their nourifhment; nothing that at all refembles the trunks of the other two-winged flies, nor any thing that can be compared to teeth. Where the teeth, if any, ought to be placed, nothing is to be feen but two hemifpheric, or more than hemifpheric bodies, black and fhining, and in all refpects refembling eyes. If thefe are eyes, they are very remarkably fituated; and juft over againft them, on the other fide of the head, and near the bafes of the antennæ, there are two other fimilar bodies, which indeed cannot be taken for any thing but eyes. It fhould feem that this fly has therefore no organs to receive aliments, but has two eyes in the place of fuch.

The want of thefe organs is nothing fingular in the infect world, fince the moths and butterflies afford us inftances of it. Many of thefe may be feen, as foon as produced from their chryfalis, in a ftate to propagate their fpecies, and depofit their eggs; and this great end atchieved, they have no farther occafion for life, nor any means for its fupport; and probably the cafe is the fame with thefe flies, which, as foon as loofe from their fhell, feek out and fecundate the females, and have after this no farther ufe for life. It is another fingularity in this fpecies, that they are produced from their fhell by their hinder part firft, whereas all other fpecies of the two-winged flies are produced with the forepart of their body firft; and if we cannot fay what may be the reafons for this fingularity in the production of this fly, we can however eafily perceive that every thing is prepared and deftined accordingly for it. In the nymphs of other flies, all the legs are conftantly applied clofe to the body, whereas, on the contrary, in the nymph of the gall-infect fly, the legs placed next the head, or the firft pair, are conftantly ranged upward, and each of them embraces one fide of the head; the conftant pofition of thefe legs in this direction is a proof that it is the order and courfe of nature in the production of the animal; nor is it without reafon that they are thus placed in a fpecies which, contrary to all others, is to force itfelf backward out of its fhell, fince they ferve very properly for the creature to pufh himfelf backward by: and as the anterior part of the cafes of other flies naturally and eafily opens to give paffage to the animal, fo the pofterior part of this does. They feem alfo to be more than ordinarily flow in their getting out, fome of them having been obferved to be ten or twelve hours, from the time of the firft appearance of a piece of each wing, to their perfect enlargement. Reaumur's Hift. Infect, vol. iv. p. 40.

GALLA, in *Geography*, a town of Arabia Felix; 24 miles S.E. of Taas.

GALLÆ. See Galli.

GALLAM, Galam, or *Fort St. Jofeph*, in *Geography*, a town of Africa, and capital of a kingdom called Kajaaga, and by the French Gallam, on the river Senegal. A fort was built here by the French, who ceded it to the Englifh, by the peace of Verfailles, in 1763; during the American war it was taken by the French, but at the peace of 1783 reftored to Great Britain. N. lat. 14° 35'. W. long. 10° 50'.

GALLAN, a fmall ifland on the coaft of Peru, in S. lat. 14°, 5 miles N. of the high land Morro Vejo, or Old Man's Head, affording between it and the high land an eligible ftation for veffels bound for Callao to cruife.

GALLAND, Anthony, in *Biography*, was born at Rollo in Picardy in 1646; he received the ufual education at the college of Noyon, whence he was taken to be initiated into fome trade. But he manifefted fo ftrong a turn for literature that it was determined he fhould proceed to Paris to purfue a regular courfe of ftudies. His affiduity and fuccefs were anfwerable to the expectations formed of him, and he foon became diftinguifhed for his knowledge in the oriental languages. He was attached to M. de Nointel's embaffy to Conftantinople and the Levant, where he collected a rich treafure of infcriptions and drawings of the antiquities of the places through which he paffed. In 1675 we find him again at Paris intimately connected with Vaillant and other medalifts, who formed fo high an opinion of his talents that they engaged him in a fecond voyage to the Levant. In 1679 he made a third voyage to the fame place at the expence of the French Eaft India company, when he perfected himfelf in his knowledge of the principal oriental languages, which qualified him for the office, which he undertook upon his return, of affiftant to Thevenot the king's librarian, and after the death of d'Herbelot he continued the publication of his "Biblioth. Orientale," and wrote a preface to it. At the age of fixty-three he was appointed royal profeffor of Arabic; and in the year 1715, he died in the feventieth year of his age. He was a learned and induftrious man, fimple in his manners, carelefs in the ordinary affairs of life, and zealoufly attached to the feveral purfuits in which he engaged. His moft popular work is his verfion of the Arabian tales, which is well known in every part of the civilized world. He was author of various other pieces tranflated from the eaftern languages, and feveral papers to be found in the Memoirs of the Academy of Infcriptions, of which body he was a moft ufeful and valuable member. He has papers, likewife, re-

fpecting

fpecting medals and matters of antiquity in other collections. Morcri.

GALLAND, AUGUSTUS, a confiderable lawyer and hiftorian of the feventeenth century, was a native of France, and rofe to the dignity of attorney-general of Navarre and counfellor of ftate. He was author of many learned works, but the principal was one, which he wrote againft the allodial rights pretended by fome of the provinces, to which he added the laws given to the Albigenfes by Simon de Montfort. He died about the year 1644, and in 1648 his fon publifhed as a pofthumous work his Memoirs for the Hiftory of Navarre and Flanders. A difcourfe to the king concerning the origin, progrefs, &c. of the city of Rochelle publifhed without a name in 1628 and 1629 was generally afcribed to M. Galland. Some years fince many genealogies of noble families drawn up by this author were to be found in the libraries of France. Morcri.

GALLANT, or GALANT, a French term, fignifying civil, polite, well-bred; or a perfon of wit and addrefs, who does every thing with a good grace: in fine, a civil perfon, fomewhat brighter, gayer, and more agreeable than ordinary.

It is difficult to define all the qualities annexed to the idea of a gallant man. It fometimes implies one who has what the French call the *bon ton;* but it generally means one who has a great devotion for the fair fex, with the manners adapted to pleafe them. The French authors are very nice on this point; they diftinguifh *galant homme,* and *homme galant.*

GALLANT, *Cape,* in *Geography,* a cape in the ftrait of Magellan, diftant about eight leagues from cape Holland: this cape is high and fteep, and between this and cape Holland lies a reach about three leagues over, called "Englifh Reach;" about five miles S. of cape Gallant lies a large ifland, called "Charles's Ifland;" and a little to the eaftward of cape Holland is a fine fandy bay, called "Wood's Bay," in which there is good anchoring. In cape Gallant bay, which may be entered with great fafety, there is a fine large lagoon, where a fleet of fhips may moor in perfect fecurity; the depth being every where four fathom, with a foft muddy ground, and on the eaft fide from fix to ten fathom, where is the beft anchoring. There is plenty of good watering from two rivers, and plenty of wood. The lagoon abounds with wild fowl, and wild celery; mufcles, and limpets are plentiful. The landing is good. The latitude of the bay and lagoon is 53° 50′ S., and longitude 73° 9′ W.; the variation is two points eafterly.

GALLANTES, among the Romans, a furname given to the priefts of Cybele; whence the modern terms of *gallant,* and *gallantry,* have been formed. See Mem. Acad. Infcript. vol. v. p. 427.

GALLAO, in *Geography,* a town of Africa, in Bambarra; 140 miles E. of Sego.

GALLAPAGOS. See GALAPAGOS.

GALLAPAGOS *Rocks,* rocks that lie on the E. coaft of the ifland of Lucaya. N. lat. 27°. W. long. 77° 10′.

GALLARATO, a town of Italy, in the department of the Olona; 20 miles W.N.W. of Milan.

GALLARDON, a town of France, in the department of the Eure and Loire; nine miles N E. of Chartres.

GALLATIN, a county of America, in Kentucky, containing 1078 inhabitants, of whom 276 are flaves.—Alfo, a poft-town of Sumpter county, Teneffee, 714 miles W. by S. from Wafhington.

GALLATON, or GALLOWTOWN, a town of Scotland, in the county of Fife; 15 miles N.E. of Edinburgh.

GALLBRUN, a town of Auftria; feven miles N.W. of Brugg.

GALLE, or *Point de Galle,* a town of Ceylon, confidered, in point of importance, as the third town on the ifland, and lying about fixty miles due S. of Columbo, in N. lat. 6° 1′. E. long. 80° 19′ 20″. The fort is ftrong, and the garrifon generally confifts of two or three companies of Europeans, half a company of artillery, and a battalion of native troops. It is commanded by the next fenior field-officer after the governors of Columbo and Trincomalee. The harbour is fpacious, particularly the outer road. The inner harbour is fecure during a great part of the year, and always, except in a S.W. wind; but it has this difadvantage, that winds from a particular quarter are neceffary to carry veffels out. At the entrance, which is narrow, lies a large rock, on which is a fmall work. The furrounding fhore is rocky and full of fhoals, dangerous to ftrangers. Ships outward bound from Europe generally come in fight of the firft land at Dondrehead, the fouthern promontory of Ceylon, and make Point de Galle the firft harbour. The houfes, both in the town and port, are fuperior to thofe of Trincomalee. The whole town is populous, and with refpect to trade ranks next to Columbo. The coaft and country about Galle is very mountainous. From the neighbouring heights, Adam's Peak is very plainly feen, and feveral of the hills in the interior. Fifheries to a very confiderable extent are carried on here; and indeed form the chief branch of its traffic. A great number of Malays and natives are employed in catching, curing, and drying the fifh to prepare it for exportation to different parts of the continent of India. Arrack, oil, pepper, cotton, and cardamoms alfo form a part of its exports. Cinnamon is alfo grown here, but not in fuch quantity as about Columbo; but in quality it is much the fame. One of the India fhips touches here annually, either before or after fhe has taken in part of her cargo at Columbo, to carry off any cinnamon that is prepared for exportation. Percival's Ceylon, p. 152.

GALLE, a fmall ifland in the Atlantic, near the coaft of Brafil. S. lat. 27° 50′.

GALLED, SADDLE. See SADDLE-*galled.*

GALLED, in *Sea Language,* is applied to a maft, yard, cable, &c. which is chafed and worn by friction. They are ufually covered with fkins, mats, canvas, &c. in thofe parts which are the moft expofed by the rocking of the veffel, as a prefervative from this injury.

GALLED *Crops,* in *Agriculture,* are fuch as have numerous thin fpots in different parts of them.

GALLEGO, in *Geography,* a town of Spain, in the province of Leon; eighteen miles S.S.E. of Salamanca.—Alfo, a river of Spain, which runs into the Ebro, oppofite to Saragoffa.

GALLEGOS, a town of Spain, in Old Caftile; thirty-five miles N.W. of Avila.

GALLEMBERG, a town of the duchy of Carniola; thirty miles E. of Laubach.

GALLEN, ST. a territory of Switzerland, bounded N. by the lake of Conftance, and on the S. by the canton of Appenzel. The whole territory of the town of St. Gallen does not exceed a mile and a half in circumference; and including the town contains near 8000 inhabitants. The abbot and town of St. Gallen are both allies of the Swifs cantons, and each enjoys the privilege of fending deputies to the general diet. The abbot of St. Gallen is titular prince of the German empire, and is chofen by the feventy-two benedictines, who compofe this chapter. He formerly poffeffed the fovereignty of the town; but the inhabitants fhook off his authority, and became independent. However, the difputes of the rival parties have been compromifed by the interpofition of the Swifs cantons. The town is entirely proteftant, and

and its government aristo-democratical; the subjects of the abbot, whose territory is very extensive, are mostly catholics. It is remarkable, that the abbey in which the prince resides is situated close to the town, and in the midst of its territory; as the town is also entirely surrounded by the possessions of the prince. The town owes its flourishing state to the uncommon industry of its inhabitants, and to the very extensive commerce, arising chiefly from manufactures of linen, muslin, and embroidery. In this town the arts and sciences are much cultivated, and literature is held in high estimation. The library belonging to the abbey is very numerous and well arranged; and among a number of monkish MSS. of which thirteen volumes in folio contain letters of the first Swiss and German reformers, contain several classic writers. To this library we owe Petronius Arbiter, Silius Italicus, Valerius Flaccus, and Quintilian, copies of which were found in 1413. Many of its curious MSS. were borrowed, during the council of Constance, and never returned.

The subjects of the abbot of St. Gallen formerly amounted to no less than 90,000. His dominions comprised, first, the ancient territory of the abbey (Alte Landschafften), and secondly, the country of Tockenburgh, which was purchased, in 1468, by Ulric abbot of St Gallen, from the last count who died without issue male. The former, or Alte Landschafften, comprehended 124 square geographical miles, occupied by 45,000 inhabitants, and the latter included 188 square miles, and the number of its inhabitants was 46,000. After various disputes between the abbot, supported by the catholic, and the people aided by the protestant, cantons, the constitution of the Tockenburgh was settled in 1718, which precisely ascertained the prerogatives of the abbot and the privileges of the people. New disputes occasionally arose, and in the effervescence of the revolution, the abbot was driven from the country, and obliged to take refuge in the Brisgau. In the new division of Switzerland, in 1798, the dominions of the abbot, and the town of St. Gallen, were comprised in the canton of Sentis, of which St. Gallen was the capital.

According to the constitution of the 29th of May, 1801, St. Gallen was annexed to Appenzel, and formed the ninth department.

Gallen-*Head*, a cape on the W. coast of the island of Lewis. N. lat. 58° 11′. W. long. 7° 4′.

GALLENBOULON, a town on the eastern coast of the island of Madagascar, situated on a creek of the same name. S. lat. 17° 20′. E. long. 54° 4′.

GALLENEK, a town of the duchy of Carniola; 14 miles S.E. of Stein.

GALLENSTEIN, a town of the duchy of Stiria; 3 miles W. of Reiffling.

GALLEON. See Gallion.

GALLERICA Lapis, a name given by the writers of the middle ages to a species of emerald, which was larger than the finer gems of that kind, and of a pleasant green, but debased by an admixture of white.

GALLERY, in *Architecture*, is an apartment of a house not always destined to answer the same purpose. Savot, in his architecture, derives the word gallery from *Gaul*, as supposing the ancient Gauls to have been the first who used them. Nicod fetches it from the French *aller*, *to go;* q. d. *allerie:* others bring it from *galere*, *galley*; because it bears some resemblance thereto in respect to health.

A common passage to several rooms in one range in any of the upper stories of a house is called a gallery. It is also used for an exhibition room of pictures. The length of galleries are (according to Palladio) from five to eight times their breadth. In churches and theatres the galleries are those platforms raised upon pillars for the accommodation of a greater number of people than could be done upon the ground floor.

Gallery, in *Fortification*, a covered walk, or passage, made across the ditch of a town besieged, with timbers fastened on the ground, and planked over.

The sides of the gallery are to be musket-proof, and to consist of a double row of planks, lined with plates of iron; and the top is sometimes covered with earth, or turf, to hinder the effect of stones, artificial fires, &c. of the enemy.

Galleries are chiefly used to secure and facilitate the miners' approach to the face of the bastion, over the moat, which is already supposed filled up with faggots and bavins, and the artillery of the opposite flank dismounted. Sometimes this is called a *traverse*.

Gallery, in *Gardening*, a kind of covered walk, in a garden or pleasure-ground, formed by trees of the hornbeam, lime, and others of the same kind, in the following manner. A line is first to be drawn to the length of the intended gallery, and this is to be planted with hornbeam, which is to be the foundation of the gallery. These require no further care than to be sheared a little, and sometimes digged about, as there may be occasion. But the chief curiosity is in the ordering the fore-part of the gallery, and forming the arches. The pillars of the porticoes, or arches, must be placed at four feet distance from one another, and the gallery must be 12 feet high, and 10 feet wide, that there may be room for three persons to walk abreast in it. When the hornbeams are grown to the height of three feet, the distance of the pillars well regulated, and the ground-work of the gallery finished, the next thing is to form the frontispiece; to perform which, the hornbeam must be stopt between two pillars at the height, and a trellis, made for that purpose, must be run up, which forms the arch. As it grows up, those branches which out-top the others, must be levelled with the shears; and in time they will grow very strong, and may be kept in regularity by the shears. Portico galleries may be covered with lime-trees.

Galleries in general have been always but slightly esteemed in England; they were once very much in repute in the gardens of Italy, and other hot countries, but now they are got out of credit even there. Miller.

Gallery *of a Mine*, denotes the branch, or that narrow passage under ground, leading to a mine carrying on under any work designed to be blown up.

The besiegers and besieged do each of them carry galleries, or branches under ground, in search of each other's mines; and these sometimes meet and destroy each other.

Gallery, in *Mining*, signifies a drift or passage under ground, in or leading to some mine: gang-way, gate, augle, audit, level, sough, brough, &c. are terms of nearly similar import, in different mining districts.

Gallery *in a Ship*, is a kind of balcony, made upon the stern, without-board, into which there is a passage out of the great cabin.

These galleries are for shew, and the captain's pleasure, rather than any other benefit; for, in ships of war, all open galleries of this kind are to be avoided; on account of the facility of an enemy's entrance and boarding of the ship that way.

Gallery-*ladder*, in a *Ship*. See Ladder.

Gallery, *Whispering*. See Whispering *places*.

GALLESE, in *Geography*, a town of Italy, in the Patrimonio; 25 miles from Rome.

GALLEY, in *Chemistry*, is the name given to reverberatory furnaces, in which several retorts may be placed at the sides

ſides of each other. They are ſo called becauſe they are oblong, and have lateral openings, in which they are ſuppoſed to reſemble galleys.

Galley, in *Naval Language*, a low-built veſſel, going both with oars and ſails; chiefly uſed by the ſtates bordering on the Mediterranean.

The galley is called by the Greek authors under the eaſtern empire γαλαια, and γαλεια; and by the Latin authors of the ſame time, *galea;* whence the modern denomination. Some ſay it was called *galea*, on account of the figure of a caſk or helmet, which it bore on its head or prow, as Ovid atteſts, De Triſtib. The French call it *galere;* becauſe they ſay that the top of the maſt is uſually cut in manner of a hat, which the Italians call *galero*. Others derive both *galea* and *galere* from a fiſh, by the Greeks called γαλιωτης, or ξιφιας, and by us the *ſword-fiſh*, whoſe ſhape this veſſel reſembles. Laſtly, others derive *galley*, *galea*, *galere*, *galeaſſe*, &c. from the Syriac and Chaldee *gaul* and *gallin*, a man expoſed on the water, or in a veſſel of wood.

The largeſt ſort of theſe veſſels, called *galeaſſe*, is employed only by the Venetians. They are commonly 162 feet long above, and 133 feet by the keel; 32 feet wide, with 23 feet length of ſtern-poſt. They are furniſhed with three maſts, and 32 banks of oars; every bank containing two oars, and every oar being managed by ſix or ſeven ſlaves, who are uſually chained to it. In the fore-part they have three little batteries of cannon, of which the loweſt is of two 36-pounders, the ſecond of two 24-pounders, and the uppermoſt of two two-pounders; three 18-pounders are alſo placed on each quarter. The complement of men for one of theſe galleys is generally 1000, or 1200. They are very convenient for bombarding, or making a deſcent on an enemy's coaſt, becauſe they draw little water; and, on account of their oars, they have often the advantage of ſhips of war in light winds or calms, by cannonading the latter near the ſurface of the water, by ſcouring their whole length with their ſhot, and at the ſame time keeping on their quarter or bow, ſo as to be out of the direction of their cannon. The galleys next in ſize to theſe, called alſo *half-galleys*, are from 120 to 130 feet long, 18 feet broad, and nine or 10 feet deep. They have two maſts, which may be ſtruck at pleaſure, and are furniſhed with two large lateen ſails, and five pieces of cannon; they have commonly 25 banks of oars, as already deſcribed. Thoſe of a ſize ſtill leſs than this are called *quarter-galleys*, carrying from 12 to 16 banks of oars.

All the galleys, both ancient and modern, are of a finer and ſlenderer make than ſhips. Formerly they made divers kinds; at preſent the galleys are all alike: all the difference between them is as to ſize, and nothing as to figure. They uſually keep towards the coaſts; though ſometimes they croſs the ſea.

The king of France formerly kept up 40 galleys for the uſe of the Mediterranean, the arſenal thereof being at Marſeilles. The general of the galleys bears a double anchor, placed in pale, behind the eſcutcheon of his arms, as a mark of his office.

Galleys in Latin are called *biremes*, *triremes*, and *quadriremes;* not on account of their having two, three, or four ranges of oars before one another, as many learned men have imagined, and particularly Scaliger and Snellius, though this laſt has wrote excellently on the ſubject of navigation; for this were impracticable; nor yet on account of their having but two, or three, or four oars, for then they would want ſtrength; but becauſe there were two, three, or four rowers, faſtened to each oar, as in the galleys uſed among us; as is very well ſhewn by the Jeſuit Dechales in his "Art of Sailing." The error was occaſioned by ſome ancient galleys, repreſented on medals, or baſſo relievos, wherein are ſeveral ranges of rowers placed over each other; but all the mathematicians, pilots, and ſhip-builders, look on this as a mere viſion; inaſmuch as Pliny makes mention of galleys of 15, 20, 30, 40, 50 rows of rowers: ſo that, if they were ranged over each other, though we were only to allow four feet for each deck, there would be a diſtance of 160 feet between the loweſt rowers and the higheſt; and yet we are aſſured that the higheſt veſſel ever built was only 72 feet high.

Scaliger affirms, that the firſt *triremis*, or galley of three ſtories, was built at Corinth; and is of opinion that what Pliny calls *long ſhips*, were what we call *galeaſſes:* the firſt of which was that of the Argonauts. Vegetius mentions a galley of five decks; and Memnon another with eight, and only one man to each oar. See Exneris.

Galley, *Captain*, is the principal galley of a ſtate, commanded by the captain-general of the galleys: in France the royal galley is the firſt.

Galley, *Patroon*, denotes the ſecond galley both of France, Tuſcany, and Malta.

The ſecond general of the galleys is always on board the royal galley; and the lieutenant on board the patroon.

The terms peculiar to galleys are very numerous, and make a new ſyſtem of ſea-language different from that uſed in ſhips.

Monſ. de Baras, an ancient officer on board the king of France's galleys, engaged himſelf in writing a new dictionary of the dialect of the galleys.

Galleys, *Condemnation to the*, is a penalty impoſed on criminals and delinquents, whereby they are adjudged to ſerve the king, or ſtate, as ſlaves on board the galleys, either for ever or for a limited time.

Condemnation to the galleys for ever imports confiſcation of lands, goods, &c.; for, in France, that which confiſcated the perſon confiſcated the goods.

A man condemned to the galleys for perpetuity is dead in a civil ſenſe. He cannot diſpoſe of any of his effects; cannot inherit; and, if he be married, his marriage is null; nor can his widow have any of her dower out of his goods.

The eccleſiaſtical courts cannot ſentence to the galleys: it is out of their juriſdiction.

By an ordonnance of Charles IX. in 1564, the judges are enjoined not to condemn a criminal to the galleys for leſs than ten years: and Henry III. by another of 1579, enjoins the captains not to detain their galley-ſlaves after their time is expired. But neither of theſe laws are now obſerved.

Galley, in *Printing*, a wooden frame or inſtrument formed of an oblong ſquare board, with a ledge on three ſides, and a groove to admit a falſe bottom called a galley-ſlice, into which the compoſitor empties the letters out of his compoſing-ſtick, as often as it is filled.

The galley, when filled, contains the matter of one page; and when they have compoſed as many pages as are required for a whole ſheet, half ſheet, or the like, they impoſe them, *i. e.* they take the ſeveral pages out of the galleys; put them into a chaſe; lock them up with the furniture; and ſo make forms ready for the preſs.

Galley-*halfpence*, a kind of coin, which, with *ſuſkins* and *doitkins*, were forbidden by the ſtatute Hen. V. cap. 1. It is ſaid they were brought into this kingdom by the Genoeſe merchants, who, trading hither in galleys, lived commonly in a lane near Tower-ſtreet, and were called Galley-men; landing

ing their goods at Galley-key, and trading with their own ſmall ſilver coin, termed galley-halfpence.

GALLI, or GALLÆ, in *Antiquity*, a name given in Phrygia to the eunuch-prieſts of the goddeſs Cybele.

The principal of them was called *Archi-Gallus*. The Galli were alſo called *Dactyli Idæi*, *Corybantes*, &c. Authors are not agreed as to the reaſon of this denomination. Some derive the name from the river Gallus; becauſe theſe prieſts drank of its waters, which inſpired them with a kind of religious fury and enthuſiaſm, and deprived them of their ſenſes to ſuch a degree, that they mutilated themſelves; this was preſcribed by Cybele as a qualification for their office: thus Ovid, "Qui bibit, inde furit."

Others hold, that the firſt prieſt of Cybele having been named Gallus, the name became appropriate to all his ſucceſſors. Voſſius, who propoſes theſe two opinions, ſeems to incline moſt to the latter; though Ovid, in the fourth of his Faſti, and Herodian, lib. i. favour the former.

When youth were initiated into this order, the cuſtom in Syria, according to Lucian, was to throw off their cloaths, to make loud cries, and with drawn ſwords to caſtrate themſelves; after which they ran about the ſtreets, carrying in their hands the marks of their mutilation, which were thrown into a houſe, and in that houſe they put on women's dreſs.

Theſe prieſts threw themſelves into a kind of phrenſy when they performed the ceremonies of the goddeſs; apparently in imitation of the young Atys, her favourite, whom they likewiſe imitated, by mutilating themſelves. For authors relate, that Cybele being deſperately in love with that young Phrygian, ſhe gave him the ſuperintendance of her ſacrifices, on condition he would keep his virginity; but that ſoon after, forgetting his promiſe, he had an affair with the nymph Sangaritis; that Cybele, provoked hereat, ſtruck him mad; that in a vehement exceſs of his phrenſy he was going to kill himſelf; and that the goddeſs, relenting, reſtored him to his underſtanding; that, out of his own remorſe, he caſtrated himſelf; and that after his example all the prieſts of Cybele from that time did the like.

Their phrenſy, at the time of the ſacrifices, conſiſted in throwing round the head with great rapidity, and making violent contortions of the whole body: they had alſo drums and flutes, wherewith they played and danced to them: as already obſerved under the articles CORYBANTES and CURETES.

Van-Dale conſiders theſe Galli as ſo many ſtrollers, vagrants, and quacks, who went about ſtrolling from town to town, playing upon cymbals and crotala, wearing on their breaſts ſmall images of the mother of the gods, in order to raiſe charitable contributions. Apuleius repreſents them as the dregs of the people, as a ſet of furious fanatics, and as infamouſly debauched. They are held in equal contempt by Clemens of Alexandria, Lactantius, Chryſoſtom, and St. Auguſtine. Nevertheleſs, we learn from Cicero, that the law provided for their ſubſiſtence, and marked out days when they had permiſſion to aſk alms, and on which none elſe were allowed to go a-begging; this kind of begging, authorized by law, occurred about once in every month, and hence the prieſts obtained the name of "Menagyrtæ" and "Metragyrtæ;" becauſe it was for the mother of the gods they collected theſe alms: they were alſo denominated, by way of deriſion, "Agyrtæ," an appellation which denotes jugglers and dealers in legerdemain for money. Accordingly Clemens of Alexandria adds to the qualifications of theſe Galli that of a fortune-teller and ſooth-ſayer, becauſe they really pretended to prediction. They had always in their retinue old women, who paſſed for ſorcereſſes. Plutarch ſays of them, ſpeaking of the verſes which they ſang, that they had brought the poetry of oracles into ſuch contempt, that by their means the true oracles of the Tripos, *i. e.* of Delphi, were wholly neglected. The ſame author adds, that they delivered their oracles extempore, or drew them by lot from certain books which they carried with them, and ſold their wretched predictions to ſilly women who were charmed with the cadence of their verſes.

GALLI, *Caput*. See CAPUT.

GALLI, *Criſta*. See CRISTA.

GALLI, *Signora*, in *Biography*, arrived in England at the ſame time as Fraſi, in 1743, when lord Middleſex was proprietor of the Opera-houſe, and the principal ſingers were Monticelli, the Viſconti, and Amorevoli. Galli's voice being of a lower pitch, which the Italians call *mezzo ſoprano*, and her appearance being leſs feminine than that of Fraſi, in "Enrico," ſet by Galuppi, ſhe firſt performed a man's part, and was afterwards frequently employed in male parts on the ſtage. There was ſomething ſpirited and intereſting in her manner; however, ſhe was little noticed by the public till ſhe ſung in Handel's oratio of "Judas Maccabæus," 1746, when ſhe acquired ſuch favour in the air "'Tis liberty alone," that ſhe was not only encored in it every night, but became an important perſonage, among ſingers, for a conſiderable time afterwards.

GALLIA, in *Geography*, a county of America, in the ſtate of Ohio; bounded N. on Waſhington and Roſs; S. and E. on the Ohio; and W. on Roſs and Scioto counties.

GALLIA, in *Ancient Geography*. See GAUL.

GALLIAMBIC, in the *Ancient Poetry*. Galliambic poems denote compoſitions in Galliambic verſes.

GALLIAMBIC *Verſe*, a ſort of iambic, conſiſting of ſix feet; 1. An anapæſt, or a ſpondee; 2. An iambic, or an anapæſt, or tribrach; 3. An iambus; 4. A dactyl; 5. A dactyl; and 6. Anapæſt.

Though one might meaſure the Galliambic verſe in another manner, and make a different arrangement and combination of ſyllables, which would give different feet. It is certain the ancients regarded little more in the Galliambic verſe beſide the number of meaſures, or intervals, without troubling themſelves about the number of ſyllables, or the kinds of feet whereof it was compoſed.

GALLIAMBUS, in *Poetry*, a pleaſant kind of verſe, uſed to be ſung by the Galli, prieſts of Cybele, in honour of that goddeſs.

The word is a compound of *Gallus*, a prieſt of Cybele, and *iambus*, a foot in the Greek and Latin verſe.

Galliambus alſo denotes a piece or compoſition in Galliambic verſes.

GALLIANO, in *Geography*, a town of Italy, in the department of the Lario; ſix miles S.S.E. of Como.

GALLIARD, JOHN ERNEST, in *Biography*, a native of Zell, in Suabia, and, according to Walther, the ſon of a French peruque-maker, and ſcholar of Marichal; though it has been ſaid by one of his biographers, that he had leſſons of the Abate Steffani, and Farinelli, director of the concerts at Hanover, and author of the ground that goes under his name, upon which Corelli's 12th ſolo is founded.

He came into England in the ſuite of prince George of Denmark; his inſtrument was the hautbois, which he played in public, perhaps for the laſt time, in accompanying Mrs. Barbier in a ſong at his benefit in Lincoln's-inn Fields playhouſe, 1722. He ſeems to have ſtudied our language on his arrival in this country with conſiderable diligence and ſucceſs; for in 1712 he was choſen by Hughes to ſet his opera of

of "Calypſo and Telemachus," for the Queen's theatre in the Haymarket. And he afterwards not only compoſed cantatas written by Hughes and Congreve, but the muſic of many entertainments and pantomimes for Lincoln's-inn Fields and Covent-garden; and, in 1742, publiſhed an admirable tranſlation of Toſi's Art of Singing. But in 1709, it is not probable that he could have been the tranſlator of Raguenet's "Parallele des Fran. et des Ital." as has been imagined, the Engliſh of which is even ſuperior to that of the tranſlation of Toſi. He was conſtantly attached to Rich, both at Lincoln's-inn Fields and Covent-garden, and compoſed for no other theatres; though his hunting ſong in the Royal Chace, "With early horn," was long the delight of every play-houſe and public place in the kingdom. Beard and Lowe hardly ever appeared on the ſtage without being called upon to ſing it, and, indeed we ſcarcely know a more agreable vocal *chaſſe*, than it ſtill continues to be.

In 1728, he publiſhed, by ſubſcription, his muſic to the hymn of Adam and Eve, from Milton; this is extremely well ſet in the grave and learned ſtyle of Steffani. The recitative is ſtill in the more ancient ſtyle of Italy, in which there are formal cloſes, terminated with a ſhake, inſtead of the more colloquial cadence of modern recitation.

He compoſed, in queen Anne's time, for victories obtained by the duke of Marlborough, a Te Deum, and Jubilate, and three anthems, for St. Paul's.

In 1746, being in years, and not in ſplendid circumſtances, Rich, the patentee, propoſed to let him have a benefit concert at Lincoln's-inn Fields; when this venerable muſician was ſo truly ſimple and ignorant of the world, that he *whiſpered* it to Quin, as a profound ſecret, deſiring him not to ſpeak of it.—"Why then," ſays Quin, "by keeping it a ſecret, you intend only good maſter Galliard, that this ſhall be a benefit for your friends, to ſave them the expence of tickets; and to wait for your own benefit, till you ſhall be allowed *benefit of clergy*—at your funeral."

At this his laſt benefit, among his other compoſitions that were performed on the occaſion, there was a piece for twenty-four baſſoons and four double baſes! This worthy muſician, who died in 1749, was certainly an excellent contrapuntiſt; but with reſpect to his compoſitions in general, we muſt confeſs, that we never ſaw more correctneſs, or leſs fancy and originality in any author that we have examined of the laſt century, Dr. Pepuſch always excepted.

Galliard, or *Gagliarda*, in *Muſic* and *Dancing*, a ſort of dance, anciently in great requeſt; conſiſting of very different motions and actions, ſometimes proceeding *terra à terra*, or ſmoothly along; ſometimes capering; ſometimes along the room, and ſometimes acroſs.

The word is French, *galliarde*, or rather Italian: and literally ſignifies *gay*, *merry*, *ſprightly*. This dance was alſo called *Romaneſque*, becauſe brought from Rome.

Thoinot Arbeau, in his Orcheſography, deſcribes it as conſiſting of five ſteps, and five poſitions of the feet, which the dancers performed before each other, and whereof he gives us the ſcore, or tablature, which is of ſix minims, and two triple times.

Galliard, in *Mining*, ſignifies, in ſome diſtricts, the ſame ſubſtance as ganiſter or crowſtone, a fine-grained ſilicious ſtone, uſually imbedded in fire-clay, and abounding with large and curious impreſſions of vegetables. See Crow-stone.

Galliard's *Iſland*, in *Geography*, a ſmall iſland of America, in South Carolina, in the Santee. N. lat. 33° 30′. W. long. 80° 10′.

GALLIARDA, in the *Italian Muſic*, the name of a tune that belongs to a dance called a galliard. The air of it is lively in triple time.

GALLIC Acid. *Acide Gallique*, Fr. *Galluſſaure*, *Gallapfelſaure*, Germ.—The infuſion of nut-galls had long attracted the attention of chemiſts, and had been the ſubject of numerous experiments before it was proved to contain a peculiar acid. Dr. Lewis, when engaged in an enquiry on the beſt method of making ink, found that the precipitate which a ſolution of galls affords with ſulphat of iron is not attracted by the magnet; he likewiſe obſerved that the black colour which it imparts to the acid ſolutions of iron is capable of being deſtroyed and re-produced by the alternate application of alkalies and acids. The academicians of Dijon went farther; they aſcertained that it reddened vegetable blues, diſſolved iron, decompoſed the alkaline hydro-ſulphurets, produced with metallic ſolutions various coloured precipitates, and, that when diſtilled, the fluid product had the ſame properties as the original ſolution; but it was reſerved for Scheele to ſeparate the acid from the ſubſtances with which they had examined it, in combination. This he in a great meaſure effected by the proceſs which he made public in 1780. The acid diſcovered by the Swediſh chemiſts, when its peculiar nature was determined, acquired, on account of the ſubſtance which firſt afforded it, the name of acid of galls, or gallic acid. But it is not confined alone to nut-galls; a variety of other aſtringent vegetables are capable of affording it.

The following method of obtaining the acid, is that diſcovered by Scheele. Make an infuſion, by macerating one part of gall-nuts, reduced to a coarſe powder, in ſix parts of cold water. At the end of fifteen days filter the ſolution, and place it in a large veſſel, covered with a ſheet of paper, in a warm room. In a ſhort time, a mouldy pellicle will appear on the ſurface of the liquid, which is to be occaſionally broken: as the operation proceeds, the original aſtringent taſte diminiſhes, and the acid taſte becomes more ſenſible. At the end of two or three months, the interior of the veſſel will be found coated with a brown matter, containing diſperſed, ſhining, granular, cryſtals. Separate this ſediment, and cover it with rectified alcohol; gently heat the mixture, and a ſolution of the cryſtallized acid in alcohol will be formed, which, evaporated, affords gallic acid in the form of very fine grains.

Scheele diſcovered that gallic acid is volatilized by a low degree of heat; and, in diſtilling nut-galls, he found the acid ſublimed and condenſed in the receiver. Mr. Deyeux was the firſt to avail himſelf of this property, in order to obtain the acid free from the tannin and extractive matter, which it always contains, when prepared in the old way. He gradually heated powdered nut-galls in a large glaſs retort, till a ſublimate aroſe, which condenſed in brilliant white cryſtalline plates. An increaſe of heat occaſions the decompoſition of the acid; and if the operation is long continued an oil diſtils over that diſſolves the acid ſublimate, and renders the experiment fruitleſs. This method, without great precaution, is very liable to fail. Mr. Davy recommends ſeparating previouſly ſome of the tannin of the nut-galls, by infuſing them, for a ſhort time, in a little water, by which means the production of empyreumatic oil is diminiſhed. The ſame chemiſt obſerves, that it is time to ſtop the operation, when the cryſtals formed in the lower part of the retort begin to melt. But, even allowing all theſe precautions are obſerved, it appears almoſt impoſſible to obtain the acid entirely free from empyreumatic oil, the preſence of which is indicated from the very commencement of the operation, by the peculiar aromatic ſmell that is produced.

A variety of other methods have been propoſed for procuring

curing the acid in a ftate of purity. It will be fufficient to mention briefly thofe which appear moft adequate to the purpofe. Mr. Davy's method: Boil carbonat of barytes in an infufion of galls; gradually add dilute fulphuric acid to the bluifh-green liquid which is thus produced, till all the barytes is feparated: the liquid, on the application of the common tefts, appears to be perfectly free from tannin and extractive matter; evaporate it to drynefs, and the gallic acid will be obtained. This method is far preferable to the one recommended by Mr. Fiedler, which confifts in digefting alumine with a folution of galls, decanting the clear liquor, and feparating the cryftals of gallic acid, (more probably of fuper-gallat of alumine.) which are produced by flow evaporation. Mr. Richter's method: Take any quantity of gall-nuts reduced to a fine powder; digeft them in cold water; agitate the mixture; pafs the liquid through a cloth; add more water to the refidual pulp; and feparate the water by means of a prefs: join the liquors, and flowly evaporate them; a brittle dark coloured fubftance remains. Cover this fubftance, reduced to a fine powder, with alcohol, and a folution of a pale ftraw-colour is formed; a fecond infufion of alcohol acquires but very little colour. Diftil the two extracts together in a fmall glafs retort to one-eighth; add water to the refidue, and expofe it to a gentle heat; evaporate the folution thus formed, and very fmall white prifmatic cryftals of gallic acid will appear. By this procefs, half an ounce of cryftals may be procured from a pound of gall-nuts. M. Bouillon La Grange, who has employed it, fays, he was never able to obtain acid of the purity defcribed by Mr. Richter. The cryftals he procured were always of a light ftraw-colour; and he found that repeated diftillations with alcohol did not render them white, the gallic acid itfelf being partially decompofed by this treatment. One objection to this method is, that unlefs the alcohol is highly rectified it diffolves a portion of tannin.

The properties of gallic acid appear, in fome meafure, to depend on the method employed for its production. The different methods, generally confidered, are of two kinds, the dry and the moift. Accordingly, there appear two varieties of gallic acid, that procured by diftillation differing confiderably from that formed by cryftallization, if any credit is to be attached to the obfervations of M. Bouillon La Grange.

Gallic acid, procured in the moift way, is of a light ftraw-colour; it has a fharp acid tafte, but poffeffes lefs aftringency than nut-galls; it changes vegetable blues to red. For its folution, it requires 12 parts of cold water, or $1\frac{1}{2}$ of boiling; and it imparts to this liquid a light lemon-colour, which becomes black by expofure to the air. Alcohol takes up, when cold, about $\frac{1}{4}$th of its weight of this acid; but at a boiling temperature, nearly its own weight. It is foluble in either. Expofed to heat, it readily fufes; it forms juft before it begins to fublime a brown vifcid fluid; full of air-bubbles; and emits vapours which have an odorous fmell. The action of a ftrong heat partially decompofes it; but to accomplifh this completely, it requires, on account of its volatility, to be fubjected to repeated diftillations, and the products appear to vary according to the intenfity of the heat applied. Scheele procured, by diftilling it in a glafs retort, firft, an acid liquor, free from oil; next, part of the acid itfelf, which, condenfed in the liquid, forms and fhoots into cryftals, as it gradually cools, and a large refidue of charcoal. M. Deyeux has found that it is capable of being converted by heat into oxygen and charcoal. From whence he concluded that it differs only from carbonic acid in containing lefs oxygen; but his reafoning is fallacious, from his not having taken into confideration the acid fluid that is alfo produced. On the contrary, M. Bouillon La Grange obtained, by its diftillation, an acidulous liquid, charcoal, and much carbonic acid gas, with which was mixed a little carburetted hydrogen gas. The latter gas was fo concealed by the former, that it did not appear inflammable till the carbonic acid gas was feparated by means of lime-water.

Gallic acid is decompofed and carbonized by ftrong fulphuric acid; the fame effect, moft probably, is produced by liquid fluoric acid; nitric acid converts it partly into the malic and oxalic acids; oxymuriatic acid, according to M. Bouillon La Grange, has no action on it; it is foluble in the other acids without decompofition.

With the earths and alkalies it combines, forming falts, denominated gallats, of which very little is known. The alkaline gallats poffefs a confiderable degree of folubility: according to Richter they give black precipitates, with the falts of iron, and precipitate all other metallic folutions. From the obfervations of Mr. Davy, the alkaline earths appear capable of combining with two different proportions of this acid, an excefs of acid rendering the falts very foluble, which before poffeffed little folubility. Gallic acid precipitates glycine, yttria, and zircon from their acid folutions, and decompofes all the carbonats.

The gallats are decompofed by a ftrong heat. Some of them have been found to yield acetic acid when diftilled with very dilute fulphuric acid.

The action of gallic acid on metallic falts appears to be proportionable to the ftrength of the affinity which the different metals have for oxygen. The folution of this acid imparts to a folution of gold a dark green colour, and produces a brown precipitate, which is metallic gold. It renders a folution of filver brown, and occafions, with the affiftance of a gentle heat, the depofition of a grey powder, which is finely divided filver. The precipitate which it gives with a folution of mercury is orange yellow; with a folution of copper, brown; with a folution of acetat of lead, white; and with bifmuth, lemon coloured. It imparts to molybdic acid a dark yellow, without occafioning any precipitate. It appears to have no effect on the falts of platina, zinc, tin, cobalt, and manganefe. When boiled on red oxyd of mercury, the acid itfelf is decompofed, and running mercury is produced. It fuffers the fame change when fimilarly treated with the black oxyd of manganefe or oxyd of tin; but thefe metals, inftead of being reduced, are brought only into lower ftates of oxydation. The moft diftinguifhing property this acid poffeffes, is that of giving dark-blue coloured precipitates with the oxygenated falts of iron. According to M. Berthollet's views of the fubject, it is not abfolutely neceffary that the iron fhould be at the maximum of oxydation for this effect to be produced, for he obferves that the falts which contain the oxyd at the minimum, though not changed at firft by gallic acid, yet become coloured; when the folution confined from air is much diluted with water. He conceives, and M. Richter is of the fame opinion, that every thing which weakens the affinity of the fulphuric acid for the oxyd promotes the combination of the gallic acid with the metal in whatever ftate of oxydation it may be: indeed the latter chemift afferts, that a folution of green fulphat of iron is never coloured by gallic acid, unlefs tannin be prefent, which, according to him, attracts the fulphuric acid, and then the gallic acid unites with the oxyd of iron feparated. Mr. Prouft, from his obfervations, has been led to a different conclufion. He thinks that iron is incapable of combining with gallic acid, unlefs highly oxydated; and he thus explains the colour which a mixture of green fulphat of iron and gallic acid acquires by expofure to the air; the blackening of ink after being poured out of clofe

 veffels,

veffels, and many of the manipulations of dyers who find their profit in this oxydating procefs carried on in the atmofphere. M. Berthollet indeed admits that gallic acid ftrikes a deeper colour with the oxygenated falts of iron, than with thofe which contain lefs oxygen; but he attributes this effect to the decompofition of the acid itfelf, and the developement of fome of its charcoal.

Such are the general properties of gallic acid procured in the moift way. M. Bouillon La Grange has pointed out a few inftances in which the acid obtained by fublimation according to the method of Deyeux differs. Thefe differences it will be neceffary to mention, they are principally the following. The fublimed acid is lefs acid to the tafte. It gives to metallic folutions precipitates of different colours. Its folution is darkened by oxymuriatic acid. It imparts variable colours to fulphat of iron, and it does not precipitate gelatine. It moreover appears to contain a little effential oil, which by diffolving the acid in water, ether, or a ftrong folution of pot-afh, feparates, becomes fenfible to the fmell, and is feen fwimming on the furface of the fluid.

The nature of gallic acid is not yet fatisfactorily determined. The generally received opinion is, that it is a fimple acid, but there are fome chemifts who maintain it to be a compound one; M. Bouillon La Grange has endeavoured to fhew that the cryftallized acid procured in the moift way is compofed of acetic acid, tannin, and extractive, and that the acid obtained by fublimation is merely acetic acid modified by a peculiar effential oil. His arguments for this opinion are, the difficulty, indeed the impoffibility, of obtaining the acid free from thefe impurities, and the production of acetic acid by the diftillation of gall-nuts with water, and alfo by fubmitting fome of the gallats to the fame operation with dilute fulphuric acid. However ingenious this reafoning may be, it is not conclufive. Doubt can be alone banifhed from the fubject, by fubmitting the theory to the teft of experiment; by endeavouring to form gallic acid of either kind by adding to the acetic the fubftances by which it is fuppofed to be modified, in the acid in queftion. It is certain, however, that, like the other vegetable acids, gallic acid is a compound of carbon, hydrogen, and oxygen, and not, as M. Deyeux maintains, of carbon and oxygen alone.

Its ufes are few, in its pureft ftate, and thefe are known alone in the laboratory of the chemift; but in combination with other fubftances, it is of extenfive and important applications in the arts. See the articles Dyeing and Ink.

Elemens de Chimie, tom. iii. Crell's Chemical Journal, vol. i. p. 24. Journals of the Royal Inftitution, vol. i. p. 274. Nicholfon's Journal, 8vo. vol. i. p. 458. Phil. Mag. vol. xxiii. p. 74. Annales de Chimie, tom. xvii. Chemical Statics, vol. ii. Annales de Chimie, tom. 60. p. 156.

GALLICAN Church denotes the church of France; or the affembly or convocation of the prelates of France.

M. du Pin has an exprefs treatife of the liberties of the Gallican church. See Church.

Gallican *Breviary* denotes the breviary ufed by the church of Agrigentum, in Sicily; which the modern writers call Breviarium Gallicanum.

The reafon, no doubt, is its having been introduced by St. Gerlan, who was made bifhop of Agrigentum, after earl Roger had been driven out of Sicily by the Saracens; and by the other French bifhops, whom the Norman princes brought thither. See Breviary.

Gallican *Liturgy* is the manner of performing divine fervice anciently obferved in the Gauls.

F. Mabillon fhews wherein it differed from the Roman liturgy. 1 Liturg. Gall. cap. 5, &c.

Gallican *Mafs*. See Mass

GALLICIA, or Galicia, in *Geography*, a province of Spain, fituated at the north-weft angle of the country, and forming a very irregular kind of quadrilateral. On the north and weft it is bounded by the Atlantic ocean; on the eaft by Afturia and Leon, and on the fouth by the Portuguefe provinces of Tras-los-Montes and Entre-douro-è-Minho. Its mean extent is about 46 leagues from north to fouth, and 140 leagues from eaft to weft. This country took its name from its ancient inhabitants, the Callaici, whence have been formed the names of Gallæci, Galiciæ, and Galicia. Gallicia was conftituted a kingdom in the year 1060 by Ferdinand the Great, king of Leon and Caftile, who gave this province to his fon Don Garcias. But till the reign of Ferdinand V. and Ifabella, in 1474, the inhabitants, hemmed in by their mountains and rivers, paid little refpect to the royal authority. The nobility exercifed a kind of fovereignty in their own territories, and countenanced their fubjects in the pillage of ftrangers. Thefe diforders, however, were terminated by Ferdinand and Ifabella, who civilized the country, and entered into an engagement with the Gallicians, that their kingdom fhould always preferve its title. It is at prefent the moft populous province in Spain. This country is, in general, very mountainous; interfected with beautiful valleys, and bounded by fmall plains; the mountains are for the moft part well wooded, and abound in game. The lands produce fome wheat and oats, a great quantity of maize, millet, flax, hemp, pulfe, lemons, and other fruit, and in fome places wine. Oak, walnut, chefnut, and hazle trees are numerous. The inhabitants rear many horned cattle and mules. One of the principal branches of the induftry of this province confifts in woollen manufactures, blankets, and hofiery, and particularly in common linens. The lands generally belong to the nobles, to churches, and to monafteries, fo that the mafs of the people have fcarcely any property. Gallicia is interfected by a chain of mountains, which proceeds from the Pyrenées near Roncevallos, between Bifcay and Navarre, directing its courfe to the north-weft, and leaving on its right the Afturias, penetrating by Leon into Gallicia, which it traverfes, and continues till it is ftopped by the fea, after forming cape Finifterre. The mountains of this Gallician branch have different names; the moft confiderable of which is the Sierra de Mondonnedo, of great extent, occupying the whole extremity of the north-eaft of Gallicia towards the Afturian boundary on the eaft, and proceeding to the north as far as cape Ortegal, and to the weft as far as the Atlantic ocean. As this province has 100 leagues of coaft its ports are numerous, fome on the north and others on the weftern ocean. In number they are more than 40, but in general they are very fmall. Thofe that chiefly deferve notice are, Maria, Corcuvion, Bayona, Pontevedra, Muroz, Guardia, Vigo, Corunna, Ferrol, Santa Marta, Vivero, Ribadeo, &c Its principal rivers are the Eo, or Rio de Miranda, which feparates the frontiers of Afturias from Gallicia, and after purfuing a courfe of 24 leagues from fouth-eaft to the north, falls into the northern ocean above Ribadeo in Gallicia, and Caftropol in Afturia; the Ulla or Ilia, which has a courfe of 23 leagues from the north-eaft to the fouth-weft; the Tambra, or Tamaris, which gives the name of Tamaricians to the people who occupy its banks, purfuing a courfe of 20 leagues from the north-eaft to the fouth-weft; the Mandeo, whofe courfe is 16 leagues from the eaft to the north-eaft; the Minho, which rifes in the eaft of the Sierra Mondonnedo, and after receiving

 feveral

ſeveral tributary ſtreams, and ſeparating Gallicia from Portugal, in a courſe of about 52 leagues, firſt from north to ſouth and then to the ſouth-weſt, falls into the ocean near the port of Guardia; the Sil, which riſes in the mountains to the weſt of Leon, and after a courſe of 33 leagues falls into the Minho. In this province they reckon 70 rivers, excluſively of ſmall ſtreams. The principal towns of Gallicia, are Compoſtella, Lugo, Tuy, Orenſe, Corunna, Finiſterre, Vigo, &c. &c. It has an archbiſhopric, San-Jago, four biſhoprics, Tuy, Orenſe, Mondonnedo, and Lugo; five cathedral and five collegiate chapters, ſeveral abbeys of Benedictines and Bernardines, two commanderies of religious orders, 3,683 pariſhes, 98 religious houſes, 30 hoſpitals, an univerſity, 5 colleges for the inſtruction of you h, 7 cities, 74 towns, 3,434 villages, upwards of 40 ports, 2,640 pariſh prieſts, 1,043 pariſh curates, 6,742 ſecular prieſts, 2,394 monks, 600 nuns, 13,800 nobles, 966 advoca es and writers, about 4,500 ſtudents, 18,900 ſervants, and the total of the population is eſtimated at 1,345,810 perſons, or, as ſome ſay, 1,500,000, and according to others two millions. Its capital in Compoſtella or Saint Jago. The climate of Gallicia is generally conſidered as mild upon the coaſt, and cold in the interior, which is expoſed to winds and heavy rains, with ſome few exceptions.

This country is reckoned rich and productive. Each farmer keeps flocks of ſheep and goats in proportion to the extent of land which he poſſeſſes or cultivates; and the Gallicians are generally deemed laborious in the culture of their ſoil, and in other departments of agriculture. But they are not much addicted to the mechanical arts or to commerce. On this account many of them ſeek ſubſiſtence in the neighbouring province, where they are employed in the moſt ſervile and laborious employments, for which they are deſpiſed by the other Spaniards. There are, however, ſome manufactories in Gallicia: ſuch are thoſe of woollen ſtuffs, coarſe cloths and hoſiery at Lugo; thoſe of ropes and ſail-cloth at Ferrol and Corunna; that of linen at Tuy; that of ſilk in the territory of Montforte, in the county of Lamos; thoſe of hats, &c. However, upon the whole, Gallicia is, with regard to manufactures, the leaſt induſtrious part of Spain. Its coaſts are ſo extenſive, and its rivers are ſo numerous, that it is plentifully ſupplied with various kinds of fiſh; ſuch as the bezugos, or hog-fiſh, which is taken in the months of November and December, and ſent quite freſh into Caſtile and Leon, ſalmon, herrings, ſhad, trout, lampreys, ſkate, eels, &c. The exports of this province are not very conſiderable; the cattle it produces, the fiſh, and the cloth it manufactures, are ſent into ſome of the provinces of Spain, and its ſalt proviſions are exported into foreign countries. They alſo ſend to other provinces table-linen, ſkins, hides, and leather, hats, tapes and knit ſtockings, wool and wine; and they alſo trade in cattle, mules and horſes. The importations from the Engliſh, French, and Dutch are received at the port of Vigo, and the exportations are ſent from the port of Corunna, from which Gallicia communicates with America, whither it ſends ſoap, ſkins, leather, and furriery, table-cloths, napkins and knit ſtockings; and in return it receives cocoa, logwood, ſugar, and other colonial productions.

Gallicia was formerly in great reputation for its mines; but thoſe that are now chiefly known are copper, lead, and tin. There are alſo white marble and jaſper between Corunna and Betanzos, and likewiſe marcaſite, vitriol, ſulphur, &c. The ſame mountains alſo furniſh excellent timber for building ſhips. Gallicia abounds in mineral waters of various deſcriptions. The woods, foreſts, and narrow paſſes of the mountains of Gallicia, were formerly infeſted with bears, wolves, foxes, wild aſſes, and birds of prey without number: but at preſent they ſupply roebucks, deer, hinds, ſtags, wild boars, and a great quantity of game. A fine breed of aſſes is preſerved, good hogs, and a large quantity of poultry.

The Callaici, who were the ancient inhabitants of this country, employed themſelves in war and hunting, and alſo in fiſhing. Their wives ploughed the land, ſowed, gathered the harveſt, and took care of their families. At preſent the traveller finds in the mountains of Gallicia ſimple and pure manners, a quiet and hoſpitable people, having no idea of luxury. The Gallicians are large, muſcular and robuſt, and capable of enduring fatigue. The women are fair, tolerably handſome, with black hair and eyes, fine teeth, and regular, but not very expreſſive features. The men,, women, and children go barefoot. In their diſpoſition they are grave, ſober, and prudent; they lead a kind of melancholy life, and keep little company. In other reſpects they are ſaid to diſtinguiſh themſelves by their probity and courage. They furniſh a great number of ſoldiers for the army; and they ſeem to be naturally inclined to arms. Thoſe of Montforte are remarked for this, as well as thoſe of Lamos, which is watered by the little river Cabe, and the capital town of which is ſituated upon a ſteep and lofty mountain. The Gallicians were the firſt poets of Spain. Before the deſcent of the Romans, they compoſed and ſung verſes, but they made little progreſs in this art. The preſent language of Gallicia is a mixture of the ancient Caſtilian of the time of Alphonſo the Wiſe, and of Portugueſe, with ſeveral expreſſions which it has retained of the ancient Roman language.

Gallicia, *New*, a province of America, in the domain of Mexico, known alſo by the name of "Xaliſco." It is rather woody and mountainous: but the plains are very fertile, and produce moſt of the European fruits. Here are alſo mines of ſilver. Zaratecas, a very rich mining country, is regarded as a diſtrict of New Gallicia.

GALLICISM, a phraſe or conſtruction, peculiar to the French language; or which has ſomething contrary to the ordinary rules of grammar of other languages.

Thus, *Cet homme eſt ſur la bouche* is a Gallicilm, having no regular conſtruction; and the ſame may be ſaid of *Fair de la terre le foſſe;* which no grammar could ever find out.

With us it is uſed to denote ſuch phraſes or modes of ſpeech in Engliſh as are formed after the French idiom.

GALLICO, in *Geography*, a town of Naples, in Calabria Ultra; 5 miles N. of Reggio.

GALLICULUS, John, in *Biography*, a German writer on counterpoint, in Latin, was contemporary with Martin Luther; and, according to Walther and Schamelius, compoſed the muſic to ſeveral Lutheran hymns and pſalm-tunes that were publiſhed at Leipſic. He was author of an ample treatiſe on counterpoint, in which the rules of compoſition, as far as the art was then known, are clearly explained; this book was printed in 1548 and 1553, and addreſſed to George Rhaw, the learned bookſeller and muſician of Wittemberg. This tract, which has for its title "Libellus de Compoſitione," contains twelve chapters, wholly appropriated to counterpoint.

There was another Galliculus (Michael) a Ciſtertian monk of Zell; who, in 1520, publiſhed a ſhort treatiſe "De vero pſallendi modo," to which Ornithoparchus refers his readers who are curious concerning the eccleſiaſtical chants. This book is in Anthony Wood's Coll. in the Aſhmol. Muſeum, Oxford.

GALLICUS Morbus, the venereal diſeaſe. See Lues Venerea.

GALLIGASKINS, in our *Old Writ rs*, denote wide hoſe

hofe or breeches, having their name from their being ufed by the Gafcoigns.

GALLIMATHIAS, a dark, perplexed difcourfe, where words and things are huddled together, fo as to make an inconceivable jargon.

The word is French, formed, as fome will have it, from *polymathia*, which fignifies diverfity of fciences; becaufe fuch as have their memory burdened with feveral kinds of fciences, are ufually confufed, and exprefs themfelves ill. M. Huet rather takes the word gallimathias to have had the fame origin with *alibonum*; and to have firft arifen at the time when all the pleadings at the bar were in Latin. There was a caufe, it feems, upon the carpet, about a cock, belonging to the plaintiff Matthias; the counfel in the heat of his harangue, by often repeating the words *gallus* and *Matthias*, happened to blunder; and, inftead of faying *gallus Matthiæ*, faid *galli Matthias*; which at length became a general name for all confufed, embroiled language and difcourfe.

GALLIMAWFRY, a ragou, hatche, or hotch-pot, made of the remains of feveral kinds of meats.

The word is French, *gallimafrée*, which fignifies the fame.

Hence the word is alfo ufed in a figurative fenfe for a piece, or compofition, of feveral different parts, ill digefted and embarraffed.

GALLINA, in *Ornithology*, the name of feveral fpecies of *Scolopax*, *Pfophia*, and *Tetrao*; which fee refpectively.

GALLINÆ, in the Linnæan fyftem of *Ornithology*, the name of a large order of birds, the general character of which is, that their beak is convex; the upper mandible is arched, and extends beyond the lower; the noftrils are half covered with a cartilaginous convex membrane; the feathers of the tails are more than twelve, and the feet are cloven; but the outermoft and inner toes are connected by the firft joint of the middle toe, by a fmall membrane. The *Otis*, *Struthio*, *Didus*, *Pavo*, *Meleagris*, *Penelope*, *Crax*, *Phafianus*, *Numida*, and *Tetrao*, belong to this order.

GALLINACEOUS, the name of a fpecies of birds of the pheafant kind, including the common cock and hen, the characters of which are thefe. The beak is fhort, ftrong, and a little crooked, proper for the picking up of corn, which is the food of the whole fpecies; the body is large, thick and flefhy; the wings are fhort and hollowed, and not calculated for much flying; they all breed a numerous progeny; they build on the ground; the young are not fed by the parent, but immediately fhift for themfelves; and fome have long fpurs behind their legs. See Cock, Fowl, and Poultry.

GALLINAGINIS Caput, in *Anatomy*. See Caput.

GALLINAGO, a general name for heath fowls, as the wood-cock, fnipe, &c. See Scolopax.

Gallinago *Minor*. See Scolopax and Snipe. See alfo Rallus.

GALLINARE, in *Geography*, a fmall ifland in the Mediterranean, near the coaft of Genoa; 10 miles S. of Finale. N. lat. 44° 2'. E. long. 8° 25'.

GALLINAS, Las. See Bissagos.

GALLINAZO, in *Ornithology*. See Vultur *Aura*.

GALLINE, in *Ichthyology*, a name given by the Maffilians to the flying-fifh, called by authors *milvus* and *lucerna*. See Trigla *lucerna*

Galline, in *Geography*, a river of America, which runs into lake Michigan. N. lat. 42° 23'. W. long. 86° 21'.

GALLING, in *Medicine*, inflammation and excoriation of the fkin by friction. See Intertrigo.

GALLINI, *Sir* John, in *Biography*, a native of Italy, a celebrated ftage-dancer and dancing-mafter, fome time patentee of the Opera houfe, and always proprietor of the concert rooms in Hanover-fquare, from the time that he fitted them up for Bach and Abel's fubfcription concerts till his death.

He came into this country early in life, after having obtained confiderable diftinction as a dancer at Paris. He feems to have come hither on fpeculation, without any previous engagement. He firft appeared on our Opera ftage in 1759, during the performance and management of the Colomba Mattei; where his ftyle of dancing pleafed fo much, that in a pas feul he was frequently encored, which we never remember to have happened to any other dancer.

We find, in a collection of the *libretti*, or opera books of the words, that he performed in 1759 in the opera of "Farnafe," compofed by Perez, where he is ftyled, "Il Signor Giovanni Andrea Gallini, director of the *balli*, and principal dancer." He has the fame titles in the operas of "Erginda" and "Ciro Riconfciuto," of the fame year, and "La Clemenza di Tito," 1760, all compofed by Cocchi. In 1761 Gherardi was ballet-mafter and principal dancer at the Opera. But in 1762, Gallini's name appears again in the opera books; and in 1763, in the comic operas of "La Calamita de' Cuori," and "La Finta Spofa," in which the De Amices fung and acted fo admirably, we find Gallini dancing with the Affelin. After this his name no longer appears in books of the lyric theatre, either as ballet-mafter or principal dancer.

It was foon after his profeffional celebrity at the Opera houfe that he married lady Elizabeth Bertie, fifter of the late earl of Abingdon, whofe father, in 1727, married at Florence the daughter of fir John Collins, knight, of a family originally Englifh; but which had long refided in Italy. Signor Collino, brother to the then countefs of Abingdon, was the laft performer on the lute in this country. The earl, his brother-in-law, died in 1760, and his countefs in 1763. The late lord Abingdon, celebrated at Geneva by Voltaire, we believe, was not in England at the time of his fifter lady Betty's marriage with Gallini; who, admitted at firft as a dancing-mafter, by his vivacity, talents, knowledge of the Italian language, and manners, fo infinuated himfelf into the favour of this noble family, as foon to be admitted as *amico della cafa*, and afterwards to a clofer alliance.

Many ridiculous ftories were in circulation at the time, of Signor Gallini's expectations of the honours which would accrue to him by his marriage into a noble family; which he imagined would confer on him the title of my lord. But he was foon convinced of his miftake, and content with an inferior title: for when the marriage became a fubject of converfation, we happened to hear in the gang-way of the Opera pit the following converfation. One of two ladies, going into the front boxes, fays to the other, "It is reported that one of the dancers is married to a lady of quality;" when Gallini, who happened to be in the paffage near the lady who fpoke, fays, "Luftriffima, fon io."—"And who are you?" demanded the lady; "Eudenza, mi chiamo Signor Gallini Efquoire."

This match, as is ufual with fuch difproportioned alliances, was not the fource of permanent felicity. They lived afunder many years. Lady Elizabeth died in the courfe of the year 1788.

By his great benefits at the theatre, and fafhion as a dancing-mafter at the principal fchools and houfes of the nobility and gentry, he, with unwearied diligence and exceffive parfimony, had accumulated a fortune fufficient to purchafe in 1786 the patent of the Opera houfe, when he became fole *imprefario* of that theatre.

It was after this period, in going to Italy to engage performers, that he obtained his title at Rome of the pope, who made him "Cavaliere del fperon d'Oro," knight of the golden

golden ſpur, the only order which his holineſs has to beſtow. But lord Kenyon, when his title was introduced in court on a trial, refuſed to acknowledge it, and treated the aſſumption with indignation and contempt. Sir John, however, continued to retain it, and was abetted by the public, in ſpite of the lord chief juſtice.

The chevalier, extremely worldly, dextrous at a bargain, and cautious in his dealings with mankind, was an unfortunate projector in his attempt at a rapid increaſe of his property. The rooms in Hanover-ſquare, we believe, were very productive, as he let every floor and every room, not only to concerts, balls, and aſſemblies, but to exhibitions, lectures, and lodgers of all kinds, ſcarcely allowing himſelf a habitable apartment for his own reſidence.

When the Opera houſe was burned down, in 1789, he advanced 30,000*l.* towards rebuilding it, and ſent an architect to Italy to procure plans of all the great theatres of that country, out of which to chooſe the moſt eligible for the new conſtruction; but it has been ſaid, and generally believed, that by ſome jumble of claſhing intereſts, or chicane of law, the management was taken out of his hands, and he not only loſt his power but his money.

While the great theatre in the Haymarket was rebuilding, ſir John fitted up the oppoſite little theatre as a temporary opera houſe, and had Marcheſi and Madame Mara to ſing; but the theatre was ſo ſmall and inconvenient, that it could not contain an audience ſufficient to cover his expences. The next year the Pantheon was transformed into an opera houſe before that in the Haymarket was finiſhed; and the unfortunate knight of the golden ſpur, tired of the ſquabbles and accidents which happened previous to the opening of his new theatre, ſold his patent, and afterwards wholly confined himſelf to the produce of his Hanover-ſquare rooms, and the exerciſe of his profeſſion as a dancing-maſter, to the end of his life.

Indeed, at the time of the French revolution, he could not reſiſt the temptations which were thrown out in that country for turning the penny in the purchaſe of the eſtates of the guillotined and emigrant nobility and gentry under the title of national domains. And he bought an eſtate near Boulogne, which coſt him 30,000*l.*; but of which, by the artifice of French lawyers, and connivance of the uſurpers, he was never able to obtain ſecure poſſeſſion, and at length abandoned all hopes of the eſtate or his money. This loſs had much leſs effect upon his avaricious character than could be expected, conſidering that he was ſo rigid an economiſt, that his private life would furniſh materials for a new drama on the ſubject of frugality.

It has, however, been juſtly ſaid of him, that he was generally conſidered as the moſt able teacher of his art that ever appeared in this country; and is ſuppoſed, by his inceſſant labours in this reſpect, notwithſtanding his great loſſes, to have left money and effects to the amount of 100,000*l.* to portion his family, which conſiſted of a ſon, in the army, and two daughters. He was a very ſhrewd, intelligent man, who perfectly knew the world; and, if he was not generous, he was, however, honourable in his dealings; and if few had cauſe to be grateful for his bounty, no one had a right to complain of his injuſtice.

In the height of his profeſſional practice and favour he publiſhed a book, in which he gave a hiſtory of dancing from its origin, and the manner in which it is practiſed in various parts of the world. It appeared in 1762, under the title of "A Treatiſe on the Art of Dancing, by Giovanni Andrea Gallini, director of the dancers at the Royal Theatre in the Haymarket," 6*s.* bound. Dodſley and Becket. We have not ſeen the original; but in the Monthly Review, for which it has furniſhed an article of 12 pages, there are ſuch copious extracts, that an idea may be formed of the work, which, till the more elegant "Lettres ſur la Dance of the celebrated ballet-maſter, Noverre," publiſhed at Stutgard in 1760, had penetrated into this country, was much read and talked of as a literary performance. Neither Gallini nor the reviewers mention Noverre's captivating book, which, perhaps, neither had ſeen; but unluckily, in a work of M. Cahuſac, publiſhed at the Hague, in three ſmall volumes, 1754, 12mo. we find all the hiſtorical part of Gallini's treatiſe, with the ſame ſtories of the wonderful powers of the ancient mimics Bathyllus and Pylades, at Rome, their quarrel, and the feuds it occaſioned. But, to ſay the truth, we, who knew Gallini from his firſt arrival in England, never thought that he had literature ſufficient to write an original work in his own language, or even to tranſlate ſuch a one as that of Noverre or Cahuſac into any language. The title of this laſt is, "La Danſe ancienne et moderne, ou Traité Hiſtorique de la Danſe."

The late active and enterpriſing artiſt, Gallini, ſeems to have had a pleaſure in his profeſſional labours to the end of his life, like Marſeille, the celebrated dancing-maſter in France, and Cavalry in England, who continued to give leſſons on their art when they had not a leg to ſtand on, much leſs with which to exemplify graceful motion. But Gallini, by temperance and exerciſe, enjoyed a good ſtate of health, and eſcaped decrepitude to the laſt: for it was ſaid in the printed accounts that "Sir John Gallini, on Saturday, 5th of January, 1805, rung his bell at eight o'clock, and, upon his ſervant entering his chamber, ordered his breakfaſt to be prepared immediately, his chaiſe to be at the door at nine o'clock, and his chariot in waiting at three." A few minutes after giving theſe directions, he complained of not being well, and ſaid, "I will reſt till nine o'clock." In half an hour he rang his bell again, and ordered medical aſſiſtance, as he had a violent pain in his ſtomach. Dr. Hayes and Dr. Wood immediately attended; but at nine o'clock he expired without a groan.

GALLINULE, in *Ornithology*, a diviſion of the genus *Fulica*, which ſee.

GALLINULA *Ærythropus*, a name given by many authors to the bird commonly called in Engliſh the *red-ſhank*. See SCOLOPAX *Calidris*.

GALLINULA *Hypoleucos*, a name given by ſome authors to the becaſſine, or, as we call it in Engliſh, the *ſandpiper*. See TRINGA *hypoleucos*.

GALLINULA *Melampus*, a name given by Geſner and ſome others to the bird more uſually known by its German name, *rotknuſſel*. See GLAREOLA *nævia*.

GALLINULA *Rhodopus*, *phœnicopus*, and *ochropus*, names by which Geſner, and ſome others, have called the common tringa; a bird in which the legs are, at different ages, and in the different ſexes, greeniſh, yellowiſh, or reddiſh. See TRINGA *Ochropus*.

GALLINULA *Serica*, a name given indiſcriminately by many authors to the grinetta and the water-rail; both birds of the moor-hen kind, but ſmaller than the common moor-hen. See FULICA.

GALLIO, in *Scripture Biography*, was proconſul, or, as it is in our tranſlation, deputy, of Achaia in the firſt century of the Chriſtian era. He was elder brother of Seneca the ſtoic philoſopher, and as his brother deſcribes his character (Nat. Queſt. l. iv. in præf.) a man of much wit and good ſenſe, of a ſweet and gentle diſpoſition, and of much generoſity and virtue. The apoſtle Paul was brought before him in the year of our lord 52 or 53; but it was

impoſſible

impossible for the enemies of the apostle to move him to give any judgment on the case. Acts, xviii. 11 — 16.

GALLIO, in *Geography*, a town of Italy, in the Vicentin; 20 miles N. of Vicentin.

GALLION, or GALLEON, formerly denoted a large vessel, or ship of war, of three or four decks.

GALLEON is now only used in speaking of the Spanish fleet; the galleons being a part of the ships employed in the commerce of the West Indies.

The Spaniards have been accustomed to send every year two fleets; the one for Mexico, which they call the flota; and the other for Peru, which they call the galleons.

GALLEON, *Manila*, is a ship employed in the trade from Manila in the island of Luconia, the chief of the Philippine islands, to Acapulco on the coast of Mexico. This ship sets sail from Manila about July, and arrives at Acapulco in December, January, or February following. There is seldom more than one ship employed in this trade at a time; but there are three or four stout ships provided to carry on this commerce, one of which is always ready for the sea when the other arrives. The largest of these ships is little less than one of our first rate men of war, and carries twelve hundred men; the others are of the burthen of twelve hundred ton and upwards, and carry from three hundred and fifty to six hundred men, with between fifty and sixty guns. These ships are commissioned and paid by the king of Spain, who pays the officers and crew; and one of the captains is called the general, and carries the royal standard of Spain at the top-gallant-mast-head. The trade from Manila to Acapulco consists of such commodities, collected in China and different parts of India, as are intended to supply the kingdoms of Mexico and Peru. These are spices, all sorts of Chinese silks and manufactures, particularly silk stockings, of which the annual ship usually carries no less than fifty thousand pair, vast quantities of Indian stuffs, as calicoes and chints, together with other minuter articles, as goldsmith's work, &c. which is performed at Manila by the Chinese, of whom there are no less than twenty thousand who constantly reside there. However this trade is not open to all the inhabitants of Manila, but is restrained by regulations similar to those of the register ships from Cadiz to the West Indies. The value of this trade is limited by the royal edicts, as it has been said by some, to six hundred thousand dollars; but it is reasonable to conclude that the return of it cannot be much short of three millions of dollars. The tonnage of the ships employed in this trade is divided into a certain number of bales of the same size, which are distributed among the convents at Manila, but principally to the Jesuits for the support of their missions; and these convents have a right to embark such a quantity of goods on board the Manila ship, as the tonnage of their bales amounts to, or to sell this privilege to others. This ship, having disposed of its effects at Acapulco, returns for Manila some time in March, where it generally arrives in June; so that the whole voyage takes up near a year. The principal return from Acapulco to Manila is always made in silver, the rest of the cargo being inconsiderable, and consisting of cochineal and sweet-meats, the produce of the American settlements, European millinery ware for the women at Manila, and some Spanish wines, as tent and sherry, which are intended for the use of their priests in the administration of the sacrament. The galleon in its return is much less incumbered with her cargo than in her passage thither; and therefore her crew is considerably augmented and her lower tier of guns is mounted, which before was carried in her hold, at least till she came near cape St. Lucas and California, and apprehended an enemy. Anson's Voyage, chap. x. p. 232—248.

These are all ships of war, and go on the king's account; but they are so loaden and embarrassed with merchandizes, that, in case of an attack, they find it difficult to defend themselves.

Beside the king's galleons, there are usually twelve or sixteen merchants ships, called register ships, belonging to private persons, who obtained leave for the same, or rather buy it; there being no West India company in Spain.

The galleons are loaded at Cadiz, from whence they may put out at any time. They were formerly appointed to be out in January, that they might coast along the firm land, and come about the middle of April to Porto Bello, where, the fair being over, they might take aboard the plate, and be at the Havannah with it about the middle of June, where the New Spain fleet would soon join them, and they might come together more safely to Spain. For this purpose, the viceroy of Peru was to take care that the plate should be at Panama by the middle of March; the plate is fifteen days in removing from Potosi to Arica; eight days generally from thence, by sea, to Callao, and twenty from Callao to Panama, taking in by the way the plate at Faita and Truxillo. But it has been found by experience, that the month of September is the fittest for the fleet to sail: they are about two years in the whole voyage. However often or seldom the galleons go out, the next fleet never go out till the last are returned. When the galleons and flota put out together, they separate about the Antilles islands; the galleons for Carthagena and Porto Bello: and the flota for Vera Cruz. At their return, they rejoin at the Havannah in the isle of Cuba.

The loading of the galleons is always the richest: an estimate of the yearly returns or cargoes, both of the flota and galleons, was formerly as follows:

Of gold, the galleons bring yearly about two or three millions of crowns, and the flota about one. Of silver, the galleons bring eighteen or twenty thousand crowns, and the flota ten or twelve. Of precious stones, the galleons bring as follow: two hundred thousand crowns worth of pearls; two or three hundred thousand crowns of emeralds; and twenty or thirty thousand crowns worth of bezoards, amethysts, and other stones of less value: the flota brings none at all. Of wools, the galleons bring forty or fifty thousand crowns: the flota, none. Of quinquina, the galleons bring the value of twenty thousand crowns: the flota, none. Of skins and leather, the galleons bring seventy thousand crowns worth: the flota as much. Of Campechy wood, the galleons bring sixty thousand crowns worth: the flota, none. Of skins and leather from Buenos Ayres, the register-ships may bring to about two hundred thousand crowns; of cochineal about a million of crowns; and of indigo, about six hundred thousand crowns.

By a general ordinance in Spain, it has been established that there should be twelve men of war and five tenders fitted out annually for the armada of galleons; eight ships of six hundred tons burthen each; and three tenders, one of a hundred tons, for the island Margarita; and two of eighty each to follow the armada. For the New Spain fleet two ships of six hundred tons each, and two tenders of eighty each; and for the Honduras fleet, two ships of five hundred tons each; and in case no flota happened to sail any year, three galleons and a tender should be sent to New Spain for the plate.

But the number of galleons has been different at different times; it has increased in time of war and diminished in time of peace.

GALLIOPOLIS, in *Geography*, a post-town in the state of Ohio, situated on the high north bank of the river Ohio, nearly 90 miles below Marietta, and three miles below the mouth of the Great Kanhaway; said to contain about 100 houses, inhabited by French people, who built it in the year 1792. They laid out gardens and encompassed them with hedges; and planted vineyards and orchards, which have been productive. The first settlers found the situation unhealthy, and endangered by the Indian war in its vicinity, and after a residence of about four years dispersed to other settlements, and particularly to Louisiana. Those who remained obtained of Congress a grant of 20,000 acres, about 24 miles lower down the river, opposite to Little Sandy Creek, whither they removed. It is distant about 240 miles E. of Columbia, and 559 S. W. of Philadelphia. N. lat. 38° 49′ 12″. W. long 83° 9′.

GALLIOT, a small galley or a sort of brigantine, built very slightly, and designed only for chace.

She hath but one mast, and can both sail and row. She usually carries two or three pedreros, and hath sixteen or twenty oars.

Some also call the bomb-ketches galliots.

GALLIPOLI, in *Geography*, a sea-port town of European Turkey, in Romania, on the sea of Marmora, with a good harbour; the residence of a pacha, and the see of a Greek bishop, suffragan of Heraclea; taken from the Christians in the year 1357 by Soliman, 80 miles S. of Adrianople, and 108 W. S. W. of Constantinople. N. lat. 40° 24′. E. long. 26° 44′.

Gallipoli, a sea-port town of Naples, in the province of Otranto, seated on a rock; surrounded by the sea and connected with the land only by a bridge; the see of a bishop, suffragan of Otranto. The chief articles of its commerce are olives and cotton, produced by trees which are planted in its environs; but the oil not being of the best kind, is principally purchased for manufactures, 25 miles W. S. W. of Otranto. N. lat. 40° 29′. E. long. 15° 58′.

GALLITRICHUM, in *Botany*, a name by which several authors call the *horminum sativum*, or garden-clarey.

GALLIVATS, in *Naval Language*, are large row-boats used in India. They are built like *Grabs* (which see), but of smaller dimensions; the largest rarely exceeding 70 tons. They have two masts, of which the mizen is very slight; the main-mast bears only one sail, which is triangular, and very large, the peak of it, when hoisted, being much higher than the mast itself. In general, these vessels are covered with a spar-deck, made for lightness of slit bamboos; and they carry only pettararoas, which are fixed on swivels in the gunnel of the vessel; but those of the largest size have a fixed deck, on which they mount six or eight pieces of cannon, from 2 to 4-pounders; they have 40 or 50 stout oars, and may be rowed four miles an hour.

GALLIUM. See Galium.

GALLO, or Punta de Gallo, in *Geography*, a small island in the Pacific ocean, near the coast of Peru, which furnishes vessels with wood and water, but is uninhabited. N. lat. 2° 28′. W. long. 76° 47′.

Gallo, a country of Africa, in the Indian sea, about S. lat. 17°.

Gallo, *Cape*, a cape on the N. coast of Sicily. N. lat. 38° 17′. E. long. 13° 2′.—Also, a cape on the S. coast of the Morea. N. lat. 36° 48′. E. long. 21° 53′.

GALLOGLASSES, a kind of militia or soldiery, in Ireland.

Camden, in his "Annals of Ireland," p. 792, relates, that the Irish militia consists of cavalry, or horsemen, called galloglasses, or galloglassii, who use a very sharp sort of hatchet: and infantry, called kernes.

GALLOMEW, in *Geography*, a town of Pegu, on the Ava; 60 miles S. of Lundsay.

GALLON is either a *Measure* or a *Weight*, of both of which there are several distinct kinds in use in England, *viz.*

Gallon *of Ale, Beer, or Vinegar Measure*, according to the acts of the 12th of Hen. VII. and 12th of Charles II., &c. often called the Winchester gallon, contains, or is equal to 4 ale quarts = 8 ale pints = 32 ale gills = 282 cubic inches English = .1631944 cubic feet = .00604424 cubic yards = 1.220779 wine gallons = 1.049107 dry gallons = .1311384 malt bushels = .5676408 cubic links. It has been said that this gallon should hold $10\frac{1}{5}$lb. of pure water?

Gallon *of Malt*, or *Dry Measure*, = $\frac{1}{8}$ of a malt bushel, according to the first and subsequent acts for levying a duty on the making of malt; it contains 2 pottles = 4 dry quarts = 8 dry pints = 268.8 cubic English inches = .155555 cubic feet = .005761317 cubic yards = 1.163636 wine gallons = .9531914 ale gallons = .5410704 cubic links. It has been said that this gallon holds 8lb. Troy of good dry wheat, or 46080 of such grains of wheat, or 9.7187lb. of pure water.

Gallon *of Wine, Cyder, Spirits, Oil, Milk, &c.* according to the act of the 5th of Ann. chap. 7. sect. 7. contains 4 wine quarts = 8 wine pints = 32 wine gills = 231 cubic English inches = .1336806 cubic feet = .004951132 cubic yards = .8191490 ale gallons = .8593750 dry gallons = .1074219 malt bushels = .4649823 cubic links. The act of 1706 directed the wine gallon to be a cylinder of 7 inches diameter, and 6 deep, which contains 230,907 inches, or 231 as above. It has been said to hold 8.3542lbs. of pure water? Casks for packing fish, beef, and pork are to be measured or gauged by the wine gallon, by the 38 Geo. III. chap. 89.

Gallon, *Apothecaries*, or *Congius*, in *Pharmacy*, = 8 pints = 128 ounce-measures = 1024 dram-measures = 231 cubic inches, or the wine gallon, as above. In the translation of the Pharmacopeia by Dr. Powell, the gallon or congius = 8 pints; the pint = 16 fluid-ounces; the fluid-ounce = 8 fluidrachms; and the fluidrachm = 60 minims. With regard to measures, the standard wine gallon of the exchequer is divided into 61,440 parts, now called *minims*, according to the glass measures originally invented by the late Mr. Timothy Lane, F.R.S. By 14 Ann. the wine gallon is fixed at 231 cubic inches, and the weight of the standard exchequer gallon of water, at a temperature of 63° and barometrical pressure = 29.52, is 58,176 Troy grains. The proportional measures are as follow: *viz.* 1 pint = 16 fluid-ounces = 128 fluidrachms = 7680 minims; and 1 fluid-ounce = 8 fluidrachms = 480 minims: and 1 fluidrachm = 6 minims.

Gallon, *Scotch*, = 4 Scotch quarts = 8 Scotch pints = 16 chopins = 32 mutchkins = 128 Scotch gills. The pints in different parts of Scotland, or according to the determination of different experimenters, (from whence they raise or deduce their other measures of capacity,) are very various; we have seen 796.48, 827.2, 828, 840, 869.312, 872, and perhaps others, at different times, stated, as the number of Scotch cubic inches in their pint.

Gallon, a *Weight*, is 12lb. of honey at the custom-house; of train oil $7\frac{1}{2}$lb. make a gallon; and of coal, in the port of Newcastle, according to Mr. Eddington, "Essay on the Coal Trade, 1803," p. 51, 6.87lbs. avoirdupoise, or $\frac{1}{16}$ths of a Winchester peck, stricken or level measure, make

make a gallon, in calculating the tonnage of veſſels on the Tyne river.

A gallon of wheat formerly (9th Hen. III. 51ſt Hen. III. 12th Hen. VII. &c.) or 8 pints, was 8lbs. Troy = 6.5828lbs. of our avoirdupoiſe weight.

GALLONIUS, Anthony, in *Biography*, a native of Rome, where he died in 1605. He excelled in theology, and was prieſt of the congregation of the oratory. His works, which were numerous, were connected with his profeſſion, but he is chiefly known by "A Treatiſe on the different Kinds of Cruelties inflicted by the Pagans on the Martyrs of the primitive Church, illuſtrated with Engravings of the Inſtruments of Torture made uſe of by them." This work was firſt publiſhed in Italian in the year 1591: it was compiled, not only from the accounts of the acts of the martyrs, many of which are of unqueſtionable authority; but alſo from ancient authors of indiſputable credit, profane as well as eccleſiaſtical. In 1594, the author tranſlated his work into the Latin language, and publiſhed it at Rome, under the title "De Sanctorum Martyrum Cruciatibus, &c." illuſtrated with wood cuts. It has ſince gone through many editions on the continent. Moreri. Bayle.

GALLOO, in *Geography*, a town of Africa, in Bambarra. N. lat. 14° 43′. W. long. 5° 10′.

GALLOON, in *Commerce*, a thick narrow kind of ferret ribband, or lace, uſed to edge or border cloaths.

The term is ordinarily underſtood of that made of wool; ſometimes that of thread, or even gold or ſilver.

GALLOP, in the *Manege*, is the ſwifteſt natural pace of a horſe, performed by reaches or leaps; the two fore-feet being raiſed almoſt at the ſame time; and when theſe are in the air, and juſt ready to touch the ground again, the two hind-feet are lifted almoſt at once.

The word is borrowed from the barbarous Latin *calupare*, or *calpare*, *to run*. Some derive it from *caballicare*; others from the Greek καλπαζειν, or καλπαν, *to ſpur a horſe*.

In galloping, the horſe may lead with which fore-leg he pleaſes; the moſt uſual way is that with the right, in which caſe the gallop is ſaid to be *juſt*; but which-ſoever it be, the hind-leg of the ſame ſide muſt follow it next, which forms an *even* or *equal* gallop; otherwiſe the legs are ſaid to be *diſunited*, and the gallop to be *falſe*; to remedy which diſorder, the rider muſt ſtay the horſe a little on the hand, and help him on the ſpur on the contrary ſide to that on which he is diſunited.

However, this rule has not been always ſtrictly obſerved; for hunting horſes have been trained to lead indifferently with both legs, becauſe it has been found, that a horſe which has never been ſuffered to gallop but with his right fore-leg, has been worn out on one ſide, when he has been freſh and found on the other. In order to make a ſtop in a gallop ſtraight forwards, the rider ſhould carefully put his horſe together, without altering or diſturbing the appuy, and throw his body back a little to accompany the action, and to relieve the horſe's ſhoulders. In doing this, he ſhould ſeize the time of making the ſtop, keeping the hand and body quite ſtill, exactly when he feels the horſe put his fore-feet to the ground, in order that by raiſing them immediately by the next motion which he makes, he may be upon his haunches. When horſes do not put out their ſtrength ſufficiently, they ſhould be gallopped briſkly, and then ſlowly again by turns, and they will thus be compelled to obey the hand and heel. In the ſlow gallop, as well as in the trot, it is ſometimes neceſſary to cloſe the heels to the horſe's ſides, which is called *pinchery*; but this ſhould be done in ſuch a manner as not to make the horſe abandon himſelf upon the hand, and care muſt be taken that he be upon his haunches, and not upon his ſhoulders: and, therefore, when he is pinched, he ſhould be kept in the hand. To put a horſe well together, and make him bring his hinder legs under him, the rider muſt cloſe his legs upon him, putting them very much back; this will oblige him to ſlide his legs under him; at the ſame inſtant let the hand be raiſed a little to ſupport him before, and yielding again immediately. Let him be thus ſupported, and have the rein again from time to time, till he begins to play and bend his haunches, and gallops leaning and ſitting down, as it were, upon them; let the rider then preſs him with the calves of his legs, and he will thus become quick and ſenſible to the touch. If a horſe has too fine a mouth, gallop him upon ſloping ground; this will oblige him to lean a little upon the hand, in order the better to put himſelf upon the haunches; and through fear of hurting his bars, he will be prevented from reſiſting the operation of the bit. If the horſe is heavy in hand, gallop him up ſloping ground; and when his appuy is too ſtrong, this will lighten him. The gallop ſerves to aſſure and make ſteady a weak and delicate mouth, and alſo to ſupple a horſe and make him ſteady and active in his limbs. Berenger's Hiſt. and Art of Horſemanſhip, vol. ii. p. 104. &c.

In a circle the horſe is confined always to lead with his fore-leg, within the turn; otherwiſe he is ſaid to gallop *falſe*. But here, too, the hind leg of the ſame ſide muſt follow.

We ſay, a *hand-gallop*, a *Canterbury-gallop*, a *ſchool-gallop*, &c. A ſmooth gallop, cloſe to the ground, the French call the Engliſh gallop, *galop à l'Angloiſe*.

Gallop *Iſlands*, in *Geography*, a cluſter of ſmall iſlands in the river St. Lawrence. N. lat. 44° 55′. W. long. 75° 18′.

GALLOPAVO, the *Turkey*, in *Ornithology*, a ſpecies of *Meleagris*; which ſee.

GALLOPER, in *Artillery*, is the name of a carriage which ſerves for a pound and a half gun. This carriage has ſhafts ſo as to be drawn without a limber, and is thought by ſome to be more convenient and preferable to other field carriages; and it may likewiſe ſerve for our light three and ſix pounders. See Carriage.

GALLOT, in *Ichthyology*, the *Wraſſe*. See Labrus *tinca*.

GALLOWAY, in *Geography*, a diſtrict of Scotland, comprehends the two ſhires or ſtewartries of Kirkcudbright and Wigton; for an account of which ſee under their reſpective names.

Galloway, *New*, a royal burgh in the ſtewartry of Kircudbright, is ſeated in a vale, on the banks of the Ken river. From its centrical ſituation its market is much frequented. King Charles I. created it a royal burgh, and advanced the lord of the manor, ſir John Gordon, to the title and dignity of viſcount Kenmure. In the year 1793 this place contained 480 inhabitants.

Galloway, a townſhip of America, in Glouceſter county, New Jerſey.

Galloway, *Mull of*, a cape of Scotland, on the ſouth coaſt of the county of Wigton, at the eaſt entrance into Glenluce bay. N. lat. 54° 44′. W. long. 4° 56′.

Galloways, is the name of a peculiar ſort of horſes, ſo called from the county of Galloway in Scotland, where they are bred. Tradition reports that this kind of horſes ſprung from ſome Spaniſh ſtallions, which ſwam on ſhore from ſome of the ſhips of the famous Spaniſh Armada, wrecked on the coaſt; and coupling with the mares of the country, furniſhed the kingdom with their poſterity. They were much eſteemed,

efteemed, and of a middling fize, ftrong, active, nervous, and hardy. Berenger's Hift. and Art of Horfemanfhip, vol. ii. p. 205.

GALLOWAY *Dyke*, in *Agriculture*, a fort of fence that is compofed of earth and ftone. See FENCE.

GALLOWS, an inftrument of punifhment, whereon perfons convicted capitally of felony, &c. are executed by hanging.

Among our anceftors it was called *furca*, a *fork*: a name by which it is ftill denominated abroad, particularly in France and Italy. In this latter country, the reafon of the name ftill fubfifts; the gallows being a real fork driven into the ground, acrofs the legs whereof is laid a beam, to which the rope is tied.

GALLOWS, in *Rural Economy*, a term applied to a fort of wooden frame formed by nailing pieces of timber together in a tranfverfe direction, and which is employed for different ufes.

GALLOWS *of a Plough*, fignifies that part of it which is called the head, and that confifts of three pieces of timber, one of which is placed tranfverfely over the heads of the other two, fo as to have fomewhat the appearance of a common gallows. See PLOUGH.

GALLS, or GALL-*Nuts*. See GALL and GALL-*Nut*.

GALLS, in *Agriculture*, a term ufed to fignify the bafe or vacant fpots in crops of grain.

GALLSTAD, in *Geography*, a town of Sweden, in Weft Gothland; 50 miles E. of Gothenburgh.

GALLUS, CORNELIUS, in *Biography*, a Roman of confiderable rank in life, and celebrated as a man of letters and poet. He was born about the year 69 B. C. Little is known of the events of his life; the moft interefting occurrence was, perhaps, his intimacy with Virgil, who is thought to have been introduced to Mæcenas by his means. That poet has infcribed his 10th eclogue to Gallus, whofe defertion by Lycoris is the fubject of the compofition. Gallus was paffionately fond of his flave Lycoris, and wrote four books of elegies to her honour, which became very popular, and which raifed him to confiderable reputation for this kind of verfe. He is referred to by Ovid as having eftablifhed an immortal celebrity:

"Gallus from Eaft to Weft fhall fpread his name,
And fair Lycoris fhare her poet's fame."

He is mentioned alfo with applaufe by Propertius, Martial, and other writers of antiquity. Lycoris was probably a feigned name for Cytheris, who captivated Marc Antony. Gallus, as well as the other poets of the age, was in high favour with Auguftus, by whom he was appointed to the government of Egypt after the death of Antony and Cleopatra. His future conduct proved that he was unworthy of this high honour. He forgot the duties of his office, and, ungrateful for the diftinguifhed favours of his fovereign, he confpired againft his government and authority, and pillaged the province, for which he was banifhed by the emperor. This difgrace operated fo powerfully upon him, that he killed himfelf in defpair A. D. 26. Some fragments of his poetry remain, which prove that he excelled in elegiac compofition. He tranflated into Latin verfe feveral books of the Greek poet Euphorbion. Virgil is faid to have written an eulogium on his friend, and inferted it at the end of his Georgics, but that through fear of Auguftus he fuppreffed it, and fubftituted the epifode refpecting Ariftæus and Eurydice. Moreri. Suetonius, &c.

GALLUS, C. VIBIUS TREBONIANUS, emperor of Rome, rofe to that high office, from being one of the chief commanders under Decius, at the time when that emperor loft his life in an action with the Goths. He afcended the vacant throne in the year 251, and difplayed his attachment to the memory of his former mafter by placing him in the rank of the gods, and by affociating his furviving fon Hoftilianus with him in the empire. At this period the Goths overwhelmed the empire, and Gallus was obliged to purchafe the retreat of thefe formidable enemies by fuffering them to retain their booty and captives, and agreeing to pay them an annual tribute. The emperor, having accomplifhed this object, returned to Rome, where he abandoned himfelf to an effeminate and voluptuous life, which rendered him contemptible and odious to his fubjects. The public calamities were aggravated by a terrible peftilence, which carried off numbers of people, and among them probably the young emperor, his coadjutor, Hoftilianus. The death of the prince was, however, imputed to Gallus, and, having once given vent to their fufpicions, the people now imputed the calamities of the former reign to the perfidious councils of the prefent emperor. The tranquillity which the empire enjoyed during the firft year of Gallus's adminiftration ferved to inflame rather than appeafe the public difcontent, and as foon as the apprehenfions of war were removed, the infamy of peace was more deeply felt; and the more fo when it was difcovered that they had not thereby even fecured their repofe, though it had been purchafed at the expence of their honour. "The dangerous fecret," fays the hiftorian, "of the wealth and weaknefs of the empire had been revealed to the world. New fwarms of barbarians, encouraged by the fuccefs, and not conceiving themfelves bound by the obligation of their brethren, fpread devaftation through the Illyrian provinces, and terror as far as the gates of Rome." The defence of the empire, abandoned by the emperor, was affumed by Æmilianus, governor of Pannonia and Mœfia, who attacked and vanquifhed the barbarians, whom he purfued beyond the Danube. In the mean time Gallus was indulging himfelf in all the pleafures which his country could afford, and was, almoft at the fame moment, informed of the fuccefs obtained over his enemies, and of a revolt of the conquering army. He marched againft his rival; but when the armies came in fight of each other, the foldiers of Gallus compared the ignominious conduct of their fovereign with the glory of his rival. A civil war was prevented by the murder of Gallus and his fon Volufianus. This event took place in the year 253, after he had reigned about two years. Univer. Hift. Gibbon.

GALLUS, CÆSAR, nephew of Conftantine the Great, was born about the year 326. He with his brother Julian, the former 12, and the latter about fix years of age, were the only princes of the collateral Flavian race who were fpared in the maffacre that took place after the death of Conftantine. They obtained a precarious and dependent life, from the affected pity of Conftantius, who was fenfible that the execution of thefe helplefs orphans would have been efteemed by all mankind as an unneceffary act of the moft deliberate cruelty. Different cities of Ionia and Bithynia were affigned for places of their exile and education, till they arrived at fuch an age as to excite the jealoufy of the emperor; he then judged it prudent to fecure the unhappy princes in the ftrong caftle of Macellum, near Cæfarea. The treatment which they experienced was partly fuch as might be expected from a careful guardian, and partly fuch as they might dread from a fufpicious tyrant. At length the emergencies of the ftate compelled the emperor to inveft Gallus, in the 25th year of his age, with the title of Cæfar, and to cement this political connection by his marriage with the princefs Conftantina. Antioch was now appointed for his refidence, and he was charged with the government of the eaftern pro-

 vinces,

vinces, and their defence againſt the Perſians. In this he was ſuccefsful; but either his own bad temper or that of his wife plunged him into all ſorts of extravagancies, and his adminiſtration was marked with moſt deteſtable cruelty, pride, and rapacity. When Conſtantius was appriſed of his conduct, he ſent two delegates to admoniſh him and reform his government: theſe he cauſed to be ſeized, bound, and, after other acts of ignominy, thrown into the river. He now had nothing to expect from the emperor Conſtantius but the ſevereſt puniſhment; he was therefore obliged unwillingly to comply with an invitation to viſit him at Milan. At length he ſet out with a numerous train, but ſoon found himſelf narrowly watched by the imperial miniſters. Upon his arrival at Adrianople, an order met him to leave behind him his retinue and advance with a few poſt-carriages, and, almoſt immediately after, he was arreſted by a military officer, ſtript of his enſigns of dignity, and carried away to impriſonment at Pola in Iſtria. The horror which he felt ſoon increaſed by the appearance of his enemy Euſebius, who proceeded to interrogate him concerning the adminiſtration of the Eaſt. Conſcious of his own demerits, he ſunk under the weight of ſhame and guilt, and confeſſed his criminal actions. The ſentence of death was ſpeedily ſigned, diſpatched, and executed; and the nephew of Conſtantine, with his hands pinioned, was beheaded in priſon like the vileſt malefactor. This cataſtrophe took place in the year 354, the fourth year of his reign. Univer. Hiſt. Gibbon.

Gallus, in *Ornithology*, the *Cock*, a ſpecies of *Phaſianus*; which ſee. See alſo Cock and Poultry.

Gallus *Indicas*, the *Alector*, a ſpecies of *Crax*; which ſee.

Gallus, in *Ichthyology*, a ſpecies of *Zeus*; which ſee. See alſo Abacatuaja.—Alſo, a ſpecies of *Labrus*; which ſee.

Gallus *Marinus*, a name given by many writers to the fiſh called in Engiſh the *doree*, and more commonly in Latin by the name of *faber*, a ſpecies of *Zeus*; which ſee.

Gallus *Marinus* is alſo a name by which ſome have called the fiſh more frequently known by the name of the *orbis piſcis*.

GALLY, on *Ship-board*, a place in the cook-room, where the grates are put up, fires lighted, and the victuals boiled and roaſted.

Gally, Henry, in *Biography*, was born at Beckenham, in Kent, in the year 1696. He was deſtined for the church, and ſtudied with that view at Bene't college, Cambridge; and in 1721 he took his degree of M. A. and was ſhortly after choſen lecturer of St. Paul's, Covent-garden. About the ſame time he was preſented with a rectory in Buckinghamſhire; and in 1725 appointed domeſtic chaplain to the lord-chancellor King, who in 1728 gave him a prebend in the cathedral church of Glouceſter. He now took his degree of doctor in divinity at Cambridge; and ſoon after was diſtinguiſhed by other valuable inſtances of church preferment. In 1735 he was nominated chaplain in ordinary to his majeſty. He died in 1769, leaving behind him ſome ſingle ſermons; a tranſlation of "The Morals of Theophraſtus, with Notes, and a critical Eſſay on Characteriſtic Writing;" "The Reaſonableneſs of Church and College Fines aſſerted, &c.;" "A Diſſertation againſt pronouncing the Greek Language according to Accents;" "A ſecond Diſſertation on the ſame Subject, in anſwer to Mr. Forſter's Eſſay on the different Nature of Accent and Quantity," and other works. Gen. Biog.

GALLY-HEAD, in *Geography*, a cape on the ſouthern coaſt of Ireland, in the county of Cork. W. long. 8° 54'. N. lat. 51° 3'.

Gally-*worm*, in *Zoology*, an inſect known by moſt writers under the name *julus*. It is a land-inſect with a long body, compoſed of a great number of rings, and furniſhed with a great number of feet. It is found very frequently in gardens, and when touched has the power of rolling itſelf up into a ball.

It has been eſteemed by ſome a valuable medicine in the jaundice, and in ſuppreſſion of urine.

This animal is very common with us among rubbiſh, and is by ſome referred to the ſcolopendræ, but improperly; for though they agree in the great number of legs, our's is a harmleſs animal, and the ſcolopendræ are miſchievous creatures, armed with dangerous forceps. It is ſuppoſed by Liſter that this creature, common with us, would, on diſtillation, yield the ſame ſort of animal acid that is procured from the ant. The reaſon of the conjecture is, that the ant and this creature both agree in emitting a ſharp and pungent ſmell on being bruiſed; but theſe are not eaſily procured in plenty enough to make the experiment, as they are not a gregarious inſect like the ant. Poſſibly ſome more of the inſects may be found, on trial, to have the ſame acid. Phil. Tranſ. N° 68.

GALNEIKIRCHEN, in *Geography*, a town of Auſtria; 5 miles N. of Steyregg.

GALOMBATZ, a town of Servia; 20 miles W.S.W. of Orſova.

GALOPINA, in *Botany*, a name concerning whoſe derivation or meaning its author Thunberg has not vouchſafed to give any account, and which no other perſon has, as yet, ventured to explain. Can it poſſibly be formed out of *Galium*, with the adjective *opina*, *thought of?* Its fructification ſtrongly ſuggeſts to the imagination that of the rough-fruited kinds of *Galium*, both in appearance and character; and Thunberg, from the compariſon which he makes between the two genera, evidently appears to have had this reſemblance in his mind. We only attempt to account for, not to juſtify, the name.—Thunb. Nov. Gen. 3. Schreb. 91. Willd. Sp. Pl. v. 1. 706. Mart. Mill. Dict. v. 2. Juſſ. 198. Claſs and order, *Tetrandria Digynia*. Nat. Ord. *Stellatæ*, Linn. *Rubiaceæ*, Juſſ.

Gen. Ch. *Cal.* none. *Cor.* of one petal, ſuperior, in four revolute ſegments. *Stam.* Filaments four, capillary, long, inſerted into the receptacle, deciduous; anthers oblong, erect. *Piſt.* Germen inferior, two-grained; ſtyles two, rather ſhorter than the ſtamens, but ſubſequently elongated; ſtigmas ſimple. *Peric.* none. *Seeds* two, nearly globoſe, with a prickly coat.

Eſſ. Ch. Calyx none. Corolla four-cleft, ſuperior, revolute. Seeds two, prickly.

1. G. *circæoides* is the only ſpecies which Thunberg recently, in Prodr. Pl. Cap. 32, reduces to the genus *Anthoſpermum*, retaining *galopina* as a ſpecific name. This plant grows in ſeveral woods at the Cape of Good Hope, flowering in December and January, and is deſcribed as follows. "*Root* annual. *Stem* herbaceous, about two feet high, erect but weak, round, red, ſmooth, rarely alternately branched. *Leaves* oppoſite, on foot-ſtalks, oblong, acute, entire, ſmooth, an inch or rather more in length; pale at the back; accompanied by ſome ſmaller axillary leaves. *Panicle* terminal, looſely ſpreading; its ſtalks oppoſite, capillary, ſmooth, bearing pairs of oppoſite briſtle-ſhaped bracteas. *Flowers* of a browniſh green."—This account of the herbage comes very near *Anthoſpermum herbaceum*, Linn. Suppl. 440, which, having been communicated by Thunberg, we preſume is the *lanceolatum* of his *Prodromus*, p. 32, though not there cited. Having never ſeen either a ſpecimen or figure of the *Galopina*, we

we cannot decide refpecting its genus. Notwithftanding Willdenow's fuggeftion concerning the fruit of *Anthofpermum*, we find no generic diftinction there, Pontedera having apparently defcribed it wrong. See Schreb. Gen. 679. Juffieu rightly fays, "it feparates into two feeds." By the fpecific name it fhould feem that *Galopina* has the habit of a *Circæa*, than which nothing can be lefs like an *Anthofpermum* or a *Galium*. S.

GALOPPE, in *Geography*, a town of France, in the department of the Lower Meufe, and chief place of a canton in the diftrict of Maeftricht. The place contains 1318, and the canton 10,733 inhabitants, on a territory of 137½ kiliometres, in 11 communes.

GALOTS, the loweft of the falls on the river St. Lawrence, in Canada; between which and the neck of land called La Galette, are an excellent country and forefts.

GALOTS, *Ifle aux*, an ifland in the river St. Lawrence; 3 leagues beyond l'Ifle aux Chevres, in N. lat. 43° 33′.

GALOUWAH, or GHALVAH, a town of the country of Nubia, feated on the Nile.

GALSTA, a town of Sweden, in Weft Gothland; 23 miles E.N.E. of Uddevalla.

GALTEES, mountains of Ireland, between the counties of Cork, Tipperary, and Limerick, fome of which are of confiderable height. They generally confift of a coarfe pudding ftone, being quartz pebbles of various fizes, imbedded in a hard argillaceous cement.

GALTELLI, a town of Sardinia, formerly the fee of a bifhop, but now decayed; 14 miles S. of Lode.

GALTEN, a fmall ifland on the weft fide of the gulf of Bothnia. N. lat. 62° 12′. E. long. 17° 17′.

GALVANI, LEWIS, in *Biography*, from whofe name the appellation of *Galvanifm* was given to a fuppofed new principle in nature, which has been alfo called animal electricity, was born in 1737 at Bologna. In his early youth he fhewed a great propenfity to religious aufterities; but being diffuaded from entering into an order of monks, whofe convent he frequented, he directed his attention to the ftudy of medicine. He purfued this ftudy under able mafters, and gained their efteem, efpecially that of profeffor Galeazzi, who received him into his houfe, and gave him his daughter in marriage. In the year 1762, after having fuftained an inaugural thefis, "De Offibus," he was appointed public lecturer in the univerfity of Bologna, and reader in anatomy to the inftitute in that city. By the excellence of his method of teaching he obtained crowded audiences, and by his refearches and experiments in phyfiology and comparative anatomy he eftablifhed a high reputation throughout the fchools of Italy. A fingular accident is faid to have given birth to the difcovery which has immortalized his name. His wife, to whom he was moft tenderly attached, being in a declining ftate of health, ufed a foup made from frogs as a reftorative: and fome of thefe animals, fkinned for the purpofe, happening to lie on a table in Galvani's laboratory, on which was placed an electrical machine, one of the affiftants in his experiments, by accident, brought the point of a fcalpel near the crural nerves of a frog lying not far from the conductor. Inftantly the mufcles of the limb were agitated with ftrong convulfions. The experiment was repeated, the fact afcertained, and a long feries of new experiments, ingenioufly varied, were put in execution, by which he inveftigated the law of nature, of which accident had thus given him a glimpfe. His firft publication on the fubject was printed for the inftitute at Bologna in 1791, and entitled, "Aloyfii Galvani de viribus Electricitatis in motu Mufculari Commentarius." This work immediately excited the attention of philofophers both in Italy and other countries, and the experiments were repeated and extended. In the hands of the celebrated Volta the agent was increafed in power to a great extent, and, directed by the genius of Mr. Davy, it has already led to moft important difcoveries in regard to the compofition of many fubftances, heretofore deemed elementary, and bids fair to change the whole face of chemical fcience.

In conjunction with his phyfiological inquiries, the duties of his profefforfhip, and his employment as a furgeon and accoucheur, in which practice he was very eminent, gave full occupation to the induftry of Galvani. In addition to a number of curious obfervations on the urinary organs, and on the organ of hearing in birds, which were publifhed in the Memoirs of the Inftitute of Bologna, he drew up various memoirs on profeffional topics, which have remained inedited. He regularly held learned converfations with a few literary friends, in which new works were read and commented upon. He was a man of moft amiable character in private life, and poffeffed of great fenfibility, infomuch that the death of his wife, in 1790, threw him into a profound melancholy. His early impreffions on the fubject of religion remained unimpaired; he was always punctual in practifing its minuteft rites; and from this caufe, no doubt, he fteadily refufed to take the civic oath exacted by the new conftitution of the Cif-alpine republic, and was confequently deprived of his pofts and dignities. In a ftate of melancholy and poverty he retired to the houfe of his brother James, a man of very refpectable character, and fell into an extreme debility. The republican governors, probably afhamed of their conduct towards fuch a man, paffed a decree for his reftoration to his profeffional chair and its emoluments: but it was now too late. He expired on the 5th of November 1798. Gen. Biog.

GALVANIC BATTERY. See BATTERY.

GALVANISM. This valuable and interefting branch of fcience has been named after its illuftrious difcoverer, profeffor Galvani, late of Bologna; and comprifes all thofe electrical phenomena arifing from the chemical agency of certain metals with different fluids.

When we view the numerous facts which have been added to the labours of Galvani, his difcoveries form a very fmall part of the great mafs. If, however, we recollect that the inveftigation began with him, and was in a great degree promoted by his own perfeverance, we muft ever confider him as a principal in this extenfive field of refearch.

Some have been inclined to give the greateft merit to fignior Volta, who was the difcoverer of the means of multiplying the effects, which Galvani produced by a fimple metallic communication; but furely Galvani has the greateft claim, fince Volta only improved upon what he had difcovered.

The whole of the hiftory which led Galvani to this difcovery we confider of little importance. Suffice it to fay, that he by accident found that common electricity had the property of producing mufcular contractions in the limbs of animals a confiderable time after death.

Of this he more clearly convinced himfelf by afcertaining that from whatever fource the electricity was drawn the effect was the fame.

In one inftance, however, he found that by the mere agency of a metallic fubftance, where he had no reafon to fufpect the prefence of electricity, the limbs of a recently killed frog were convulfed. After making a number of experiments, he afcertained that the convulfions were produced only when diffimilar metals were employed.

The experiments of Galvani were repeated by many philofophers,

lofophers, both on the continent and in this country. None, however, added any thing new to what Galvani had difcovered, excepting the celebrated Volta.

We have not, perhaps, in the hiftory of any fcience, more abundant proof of the bad effects of too early entering into theoretical fpeculations upon new difcoveries, than are prefented in the hiftory of Galvanifm.

About 40 years prior to Galvani's difcovery, a perfon of the name of Sultzer gave an account of the following fact. If a piece of lead and a fimilar piece of filver be laid together, and the edges of both be brought in contact with the tongue, a tafte is perceived fimilar to that of vitriol of iron, at the fame time [that the metals applied feparately produce no effect. The obferver of this fact does not appear to have been furprifed at the effect. At that time the doctrine of vibrations was employed to explain all natural phenomena. He therefore concluded that fome peculiar vibrations took place from the contact of the metals, which produced the peculiar fenfation on the tongue. All the world were fatisfied with this explanation; and thus a prominent fact had flept in obfcurity from the time of Sultzer to the time of Galvani.

Fortunately, however, for the philofophical world, the age in which Galvani made his difcovery was not an age of conjecture and fancy; for the time had arrived when experiment was deemed the only teft of truth.

It appears that Galvani, at the time of his difcovery, was enthufiaftic in the application of electrical theory to animal economy; and when he found the metallic fubftances were capable of exciting mufcular motion, he was confirmed in the opinion, that the inherent electricity of the animal was tranfmitted from the nerves to the mufcles by the metals employed. Had this opinion been generally received, in all probability this fubject would not have received much improvement.

About this time, however, fignior Volta took up the fubject, and philofophy has to rejoice that his mode of theorizing, although not ftrictly true, has contributed principally to its rapid advancement. He fet out with the idea, contrary to Galvani, that the electricity in queftion did not belong to the animal, but to the different metals employed. Galvani, therefore, was unlikely to produce any greater effect than what two pieces of metal could effect, becaufe he believed the electricity to be in the animal. Volta was led to the difcovery of the battery by combining a number of pieces of metal together, becaufe he was perfuaded that the electricity was in the metals and fluids employed.

He repeated the experiments of Galvani, and found that when two pieces of metal of different kinds were placed in different parts of an animal at the fame time that the metals were brought in contact, or were connected by a metallic arc, as often as the contact was made, convulfions were obferved. He found that the greateft effect was produced when the metals were zinc and filver. When feveral pairs of metals were employed, having pieces of moift cloth between them, the effect appeared to increafe as the number of pairs.

This important difcovery of accumulating the effects of this fpecies of electricity was made by Volta in 1800, and hence has been denominated the Voltaic pile. The apparatus, as firft made by Volta, confifted of a certain number of pairs of zinc and filver plates, feparated from each other by pieces of wet cloth. Hence the arrangement was as follows: zinc, filver, wet cloth; zinc, filver, wet cloth, and fo on. The filver plates were chiefly filver coins, the plates of zinc and the pieces of cloth being of the fame fize. He found this pile much more powerful when the pieces of cloth were moiftened with a folution of common falt inftead of pure water. A pile confifting of forty pairs of plates he found to poffefs the power of giving a very fmart fhock, fimilar to that of a fmall electric jar; and that this effect took place as often as a communication was made between each end of the pile, and as long as the pieces of cloth remained moift.

An account of this difcovery was communicated to the Royal Society, and publifhed in the Philofophical Tranfactions.

We do not hear of this celebrated philofopher making any further difcovery after the invention of the pile, and afcertaining the nature and extent of its effects upon animals.

The firft experiments made upon the pile in this country appear to have been made by Meffrs. Nicholfon and Carlifle. After obferving the effects then already afcribed to the piles on bringing the wires from each end of the column in contact with a drop of water, they obferved a difengagement of bubbles of fome elaftic fluid.

On clofer examination they found the gas to be hydrogen. They then took a glafs tube, about half an inch in diameter, into each end of which a cork was inferted, the tube being filled with water. Through each cork was introduced a brafs wire, fo that the ends of the wires in the glafs were about $1\frac{3}{4}$ of an inch. The pile employed confifted of 36 half crowns, and as many fimilar pieces of zinc, and wet pafteboard. The zinc end of the pile was then connected with one of the wires in the tube, and the filver end with the other; fo that the circuit formed by the pile and the wires was feparated by the water in the tube placed between them. A ftream of bubbles was obferved at the end of the wire, in the tube connected with the filver end of the pile, No gas was difengaged from the oppofite wire, but it fpeedily became tarnifhed, firft of an orange colour, and ultimately black. The tube was then reverfed, when it was obferved that the wire, which in the firft experiment became tarnifhed, gave out bubbles, while that which had before given out gas, in its turn became tarnifhed.

The emiffion of gas from the wire connected with the filver end of the pile was conftant and uniform, except when a metallic circuit was formed between the ends of the pile, during which no gas whatever appeared. It was obferved that when this metallic conductor was removed, the appearance of the gas was not immediate, fince there was an interval of about two feconds between removing the wire, and the appearance of bubbles. After the procefs had continued two hours and a half, a bulk of gas was produced equal to two-thirds of a cubic inch. This gas was mixed with an equal bulk of common air, and exploded on the application of a lighted taper.

Thefe ingenious experimenters, fuppofing the phenomena in queftion to arife from the decompofition of the water, thought it furprifing that the hydrogen fhould make its appearance at a diftance of $1\frac{3}{4}$ of an inch from the point where the oxygen was difpofed of.

They then made the experiment with a longer tube, but no appearance of gas was obferved at the diftance of thirty-fix inches. When they introduced an infufion of litmus inftead of pure water, they obferved that the fluid in the vicinity of the wire connected with the zinc end of the pile became red, and hence were led to fuppofe that an acid had been produced. The fluid at the other wire was not changed, but gas, as ufual, was evolved.

Mr. Nicholfon afcertained that the zinc end of the pile was in the plus ftate of electricity, and the oppofite end in the minus ftate.

They next varied the experiment by inferting into the tube

tube of water wires of platina inſtead of braſs. Under this circumſtance, both the wires gave out gas, but neither of them were tarniſhed. There appeared to be a larger volume of gas from the ſilver end than from the zinc. The apparatus was ſo arranged that the gaſes were ſeparately collected. On examination, the gas from the ſilver end was found to be hydrogen, as before, and that from the zinc end oxygen. Their proportions were found to agree with the component parts of water.

The Galvanic energy, evinced in the decompoſition of bodies, was further proſecuted by Mr. Cruickſhank of Woolwich. He employed in his experiments a pile conſiſting of from 40 to 100 pairs of plates of ſilver and zinc about $1\frac{1}{2}$ inch ſquare.

He alſo provided a glaſs tube, into each end of which a cork was inſerted, one of which was cloſely cemented ſo as to be air-tight; through each of the corks a ſilver wire was paſſed, the ends in the tube being at a certain diſtance from each other. The tube, being filled with water, was placed perpendicularly in a cup containing water, with the uncemented cork downwards.

On the wires being connected with the ends of the pile, bubbles began to appear at the wire connected with the ſilver end of the pile. At the end of the other wire bubbles alſo appeared, and at the ſame time a white cloud, which became of a darker colour, and ultimately purple or black. The gas was collected and found to conſiſt of oxygen and hydrogen in the proportion of one to three. The wire from the zinc end of the pile was much corroded and even diſſolved, which fully accounted for the deficiency of oxygen in the gaſſeous form. Mr. Cruickſhank very truly conjectured, that the cloud which became black was the murat of ſilver, the muriatic acid having been derived from ſome muriatic ſalt in the water employed.

With a view to aſcertain how far his conjecture was right, he filled the tube with diſtilled water, containing an infuſion of litmus. The appearances, with reſpect to the evolution of gas, were ſimilar to the laſt experiment; but the fluid in the vicinity of the wire coming from the zinc end of the pile, became of a red colour, while the fluid about the other gradually loſt its purple tinge, and became of a deeper blue. In ſhort, an acid appeared to be produced about the former wire, and an alkali about the latter. An infuſion of Brazil wood underwent ſimilar changes to thoſe obſerved by an acid and an alkali. In all theſe experiments a quantity of ſilver was oxyded, and when water was employed, a portion was always diſſolved, ſome of which was precipitated at the wire from the ſilver end of the pile by the alkali which was produced.

This ingenious experimenter, knowing that hydrogen in its naſcent ſtate was capable of reducing moſt metallic oxyds, filled the tube with a ſolution of acetat of lead, and found that the hydrogen all diſappeared, being employed in the reduction of the metal. By this means he alſo obtained pure oxygen gas. The ſame was obſerved when ſolutions of nitrat of ſilver and ſulphat of copper were employed. When a ſolution of muriat of ammonia was employed in the tube, the ſilver became oxydated, the oxyd combined with the muriatic acid of the ſalt, and the liquor afterwards ſmelt ſtrongly of ammonia. In a ſimilar way the muriat of ſoda and nitrat of magneſia were decompoſed.

Mr. Cruickſhank repeated the above experiments, but inſtead of ſilver wires, he inſerted into the tube wires of gold. The proportion of oxygen gas was now much greater than with the ſilver wires, the gold wire not being ſuſceptible of oxydation in the proceſs.

His next attempt was to collect the gaſes ſeparately; this he effected by a tube about ten inches long, which was bent into the form of the letter V; the wires were paſſed through corks firmly cemented into the ends of the tube, coming near to the angular point. A ſmall hole was made in the angular point of the tube, by which it was filled with water. The tube was then inverted in a cup of water, and the connection made with the other ends of the wires and the pile. By this contrivance the hydrogen gas aſcended into one leg of the tube, and the oxygen into the other. He next filled the tube, firſt employed, inſtead of water, with muriat of lime; the rapidity of the proceſs was much increaſed. The gold wire on the zinc ſide became partly diſſolved, and the fluid in its vicinity aſſumed a yellow colour. When the tube was opened, a ſtrong ſmell of aqua regia was perceived. Similar phenomena were obſerved when muriat of ſoda was employed.

Having tried the effect of Galvaniſm upon acid ſolutions of metals, he was induced to try what effect was produced upon alkaline ſolutions, for this purpoſe he added an exceſs of ammonia to a ſolution of nitrat of ſilver. He found, as might be expected, that metallic ſilver was formed at the wire from the ſilver ſide, and a dark grey ſubſtance depoſited upon the oppoſite wire, which he afterwards found to be the fulminating ſilver of Berthollet. When an ammoniacal ſolution of copper was employed, the copper became reduced upon the wire from the ſilver ſide.

In addition to the ingenious experiments made by Mr. Cruickſhank, we are indebted to him for the diſcovery of what is called the Galvanic trough. This conſiſted of a wooden box, of a width and depth agreeable to the ſize of the plates, and of convenient length for handing about. The inſide was furniſhed with grooves, paſſing acroſs the ſide and bottom, for the reception of the plates, at ſuch a diſtance, that when the plates were cemented into the grooves, the trough was divided into a number of cells about $\frac{3}{8}$ths of an inch wide; each of theſe plates were compound, two plates, one of zinc, and the other of copper or ſilver, ſoldered together. The order in which they were placed was ſuch that all the zinc ſides of the plates faced one way, and the copper ſides the other. In fact the trough was the pile placed horizontally, the cells being for the reception of a fluid, to anſwer the purpoſe of pieces of wet cloth.

This apparatus was found ſo much more convenient in making the different experiments than the pile, that it was generally adopted in this country.

The trough conſtructed by Mr. Cruickſhank conſiſted of fifty plates each of zinc and ſilver, each plate being $2\frac{1}{4}$ inches ſquare. This trough was found very powerful in giving the ſhock. A ſmall piece of ſteel wire being employed to unite the end of the trough as ſoon as the end of the ſmall wire came in contact with a piece of metal connected with the other, a vivid ſpark was obſerved with ſlight ſcintillations: a ſmall piece of phoſphorus being placed at the end of the wire, on the contact being made, inſtantly inflamed.

When the contact was made with a ſlip of leaf gold, it was deflagrated with a bright flame, of a white colour, leaving a dark ſtain upon the metal touched by the gold leaf.

Batteries of much larger ſize were ſoon conſtructed by different philoſophers, by which it was found that all the metals, reduced into thin leaves, were deflagrated with brilliant, though differently coloured flames.

It was in this ſtage of progreſs of Galvaniſm, that ſome uncertainty exiſted reſpecting the preciſe nature of the fluid, to which theſe ſurpriſing effects were attributed. Although it was generally ſuppoſed the effects were purely electrical, ſome were inclined to doubt the identity of the two fluids, particu-

particularly ſo far as regarded the chemical effects of Galvaniſm. This matter, however, was finally ſet at reſt by a courſe of ingenious experiments made by Dr. Wollaſton.

He introduced into each of two glaſs tubes of very ſmall bore a piece of very fine gold wire. He then fuſed the glaſs at one end of each and drew it out, ſo that the glaſs compleatly enveloped the gold wire in that part. Each of theſe ends of the tube were ground off ſmooth and flat, ſo that the bare ends of the wire were preſented to the water. The ends of the tubes ſo prepared were introduced into water, and the oppoſite ends connected with an electric machine, the one with a negative conductor, the other with the poſitive conductor. The wire connected with the former gave out bubbles of hydrogen, while that connected with the latter afforded bubbles of oxygen gas. When theſe wires were immerſed in a metallic ſolution, the metal became reduced at the negative ſide. Indeed all the effects were produced by nitric acid, metal, ſulphuret, water, nitric acid, metal, and ſo on. He afterwards made a pile even without metal, by ſubſtituting charcoal in the latter arrangement inſtead of metal.

From the ſteady and perpetual action of the Galvanic battery, it was expected by phyſiologiſts that ſomething important would be effected by it as a medical agent. Theſe inquiries, however, were not attended with great ſucceſs, and in conſequence gave way to reſearches connected with the effects of Galvaniſm, as a chemical agent.

In the experiments of Cruickſhank, it may be remembered, that when the wires coming from each end of the battery terminated in a glaſs tube, ſtrong ſigns of acidity were obſerved in the vicinity of the wire from the zinc end, while the preſence of an alkali was detected around the oppoſite wire. The preſence of muriatic acid and an alkali had alſo been obſerved by other experimenters in the experiment where decompoſition of water took place. An account was publiſhed by a Mr. Peel of Cambridge in the Philoſophical Magazine, vol. xxi. p. 279; in which he aſſerts, that during the experiments in which water was decompoſed, a quantity of muriat of ſoda was formed. This experiment was repeated by many philoſophers according to Mr. Peel's deſcription, but without the production of any ſalt whatever. It was afterwards aſſerted, that no ſuch perſon as Mr. Peel could be found, and the experiment was believed to be a groſs impoſition.

In the ſame number of the Philoſophical Magazine M. Pacchioni is ſaid to have produced free oxymuriatic acid from pure diſtilled water, by the Galvanic proceſs, in ſuch quantity as to diſſolve the gold wire which it ſurrounded.

At the time theſe facts were announced, the author of this article took great pains to inveſtigate this point. After repeated experiments made in the manner deſcribed by Peel and Pacchioni, he did not in any inſtance diſcover the preſence of muriatic acid, when pure water was employed. He then tried the experiment as follows: he took a glaſs tube about a quarter of an inch in diameter, and 2½ inches long. Upon one end was tied a piece of thin bladder, ſo as to render the tube capable of holding water. A cork was looſely introduced into the other end of the tube, through which was paſſed a platina wire, reaching within about a quarter of an inch of the bladder. The tube was then placed in a ſmall platina cup, and connected with the zinc end of the battery, while the platina wire was connected with the other end, the tube being filled with diſtilled rain water. In a very ſhort time ſtrong ſigns of acidity were obſerved in the cup, which proved to be the muriatic, and ſoda was found in the tube in ſuch quantity, that when the two portions were mixed together they became neutral.

This experiment was repeated with the ſame apparatus, even without changing the bladder more than twenty times, producing in the ſame time about the ſame quantity of acid; an alkali which had been produced by the Galvanic apparatus, this ingenious experimentaliſt produced by the common electric machine.

Another very valuable diſcovery was made by Dr. Wollaſton, by which we are enabled to aſcertain the relative Galvanic power produced by the contact of different metals in different fluids. He took a piece of zinc and a piece of ſilver, and immerſed each extremity into a veſſel containing very dilute muriatic or ſulphuric acid. The zinc was oxydated and diſſolved in the uſual manner, affording much hydrogen gas, but no action took place upon ſilver. When, however, the two extremities, out of the fluid, were brought in contact, the ſilver began to give out bubbles of hydrogen, which continued ſo long as the connection was formed, and as inſtantly ceaſed when the ends were ſeparated.

When the pieces of metal were ſimilarly placed in a ſolution of copper, the ſilver did not afford hydrogen, but the copper was precipitated in the metallic form upon the ſilver.

The apparent facility with which this ſingle combination produced the chemical effects of Galvaniſm, induced Dr. Wollaſton to try how ſmall a quantity of electricity was capable of effecting the decompoſition of water. For this purpoſe he lined the inſide of a very ſmall glaſs tube with a ſolution of gold in aqua regia, and then by heat expelled the acid, leaving a very fine film of metallic gold upon the inner ſurface. The tube being melted, converted the thin film into a very fine thread of gold. When the ends of this fine thread were expoſed to the water in the uſual manner, it was found that the mere electrical current, excited by the machine, in its paſſage from the negative to the poſitive conductor, effected the decompoſition of water. With a view to aſcertain whether the other chemical effects, ſuch as had been effected by the pile, could be produced by the electric machine, he took a card, coloured with a ſtrong infuſion of litmus, and touched it with two gold points connected with each ſide of the machine, the points being about an inch from each other; the card at the ſame time being nearly dry. Around the point connected with the poſitive ſide, the litmus became red. When, however, the points were reverſed, the negative points being applied to the reddened part, the blue colour became reſtored.

Some valuable experiments were about the ſame time made by Mr. Davy of the Royal Inſtitution, with a view to aſcertain whether two diſſimilar ſubſtances were eſſential to the production of this ſpecies of electricity, which, according to the opinion of Volta, had hitherto been ſuppoſed. This ingenious chemiſt found that a pile could be conſtructed with one metal only, provided one ſide of the plate were in contact with a fluid of deoxydating quality: the other with an oxydating liquid, and the two liquids ſeparated by liquid of a neutral nature. This he effected by the following arrangement: metal, ſulphuret of potaſh, water.

All circumſtances conſidered, ſo ſtrongly favoured the idea of the formation of the acid and the alkali, that the author of this article did not heſitate to publiſh the fact. In a converſation with an eminent chemiſt, it was hinted that the acid and alkali might be derived from the animal ſubſtance ſeparating the two fluid portions, and that the alkali might even be derived from the glaſs tube.

In order to do away the objections of the animal ſubſtance and the glaſs tube, he procured a tube about three inches long and half an inch in diameter, made of tobacco-pipe clay. This tube being filled with diſtilled water, and placed

placed in a platina cup connected with one end of the battery, a platina wire was placed in the tube, and connected with the other end. The action took place very rapidly, and the acid and alkali formed as uſual. An account of this experiment was publiſhed in Nicholſon's Journal for Auguſt 1806.

Theſe experiments are not noticed by any philoſopher till they were atteſted by Mr. Davy, in the very valuable paper entitled "Some Chemical Agencies of Electricity," which was read by him to the Royal Society, Nov. 20, 1806, and publiſhed in their Tranſactions for 1807, part i. vol. 17. Supplement.

Mr. Davy, after alluding to the experiments of Peel and Pacchioni, mentions the experiment, above deſcribed, with the clay tube. He does not object to the reſults of the experiment, but thinks the concluſions are objectional. Firſt, becauſe the alkali was only teſted by turmeric paper, which would have aſſumed the ſame appearance with lime; and, ſecondly, that the clay might even contain potaſh. The argument of Mr. Davy may very ſufficiently account for the alkaline appearances, but he does not even hint how the muriatic acid was formed.

Mr. Davy procured two agate cups, each having the capacity of about a quarter of a cubic inch. Theſe cups were boiled for ſome hours in diſtilled water. The cups were then filled with diſtilled water, and connected together with a piece of very white amianthus, previouſly moiſtened. A piece of platina wire was introduced into each of the cups, and connected with a battery conſiſting of 150 pairs of plates four inches ſquare, and charged with a ſolution of alum. After the proceſs had gone on 48 hours, the water in the cups was examined, when it was found that the water of one of them contained ſoda, and the other muriatic acid.

Mr. Davy repeated the experiment in the ſame cups ſeveral times, and found that acid and alkali diminiſhed in every experiment. By continuing the proceſs for three days, he found very little alkali; but in the other tube was an abundance of acid, which proved to be the nitric acid.

After theſe reſults, he concluded that the agate tubes contained ſome ſubſtance capable of affording the acid and alkali. But independent of the tubes, he ſuppoſed that the alkali was derived from ſome other ſource, ſince it continued to appear to the laſt in quantities ſufficiently diſtinguiſhable after every precaution had been obſerved.

Mr. Davy now began to ſuſpect the purity of the water, although it had been diſtilled. It appeared pure by the teſts of nitrat of ſilver and muriat of barytes; but as potaſh and ſoda are capable of riſing by rapid diſtillation, and as the water was from the New River, which contains animal and vegetable matter, he thought that potaſh or ſoda might be furniſhed by the neutral ſalts they contained.

To do away the objection of the agate tubes, he employed two cones of pure gold, each holding about 25 grains of water. The cones being filled with diſtilled water, and connected with the ſame piece of amianthus, which was employed for the agate tubes, they were made to communicate with a battery of 100 pairs of copper and zinc plates of ſix inches ſquare. In ten minutes the water in the negative cone, or that connected with the copper ſide of the battery, gave ſigns of an alkali. In 14 hours the acid produced in the other cone was very conſiderable, but the alkali did not appear greater than in the firſt trial. The alkali was a fixed one, and the acid appeared to be nitrous. This experiment was repeated, and carried on for three days, but the alkali did not increaſe.

Mr. Davy was now of opinion, that the water contained ſome ſubſtance capable of furniſhing the ſmall and limited portion of alkali in this experiment. And to be more ſatisfied of this, he evaporated a quart of the diſtilled water at the temperature of 140° Fahrenheit in a ſilver ſtill. The ſolid matter was equal to $\frac{7}{10}$ths of a grain. He did not enter into a particular analyſis of this reſiduum, but believed it to conſiſt of nitrate of ſoda and nitrate of lead, ſuppoſing the latter to have been derived from the worm of the common ſtill. On filling the gold cones with the water uſed in the firſt experiments, the maximum of effect was ſoon produced; but upon introducing ſome of the reſidual matter obtained from the water, in leſs than two minutes the effects were evident, and in five minutes it changed turmeric paper to a deep brown.

By ſubmitting the water to a ſecond ſlow diſtillation it was obtained ſo pure, that when acted upon in the cones by the battery for two hours, only ſlight ſigns of the alkali were evinced, which after heating ſtrongly for a few minutes diſappeared; a proof that the alkali was ammonia. Hence Mr. Davy concludes that the fixed alkali is not formed in the experiment, but afforded by the water or other ſubſtance employed.

This indefatigable experimenter made a ſeries of experiments, in which he employed cups of different ſubſtances, with the pure water. Tubes of wax afforded potaſh, ſoda on one ſide, and ſulphuric and muriatic acids on the other. With tubes of reſin, the alkaline matter was principally potaſh. Carrara marble afforded lime and a fixed alkali, but the latter decreaſed in every experiment, till nothing but lime was produced. Mr. Davy uſed many other mineral ſubſtances, from moſt of which he obtained more or leſs fixed alkali.

He had before ſuppoſed, that when glaſs veſſels were employed, the fixed alkali was derived from the glaſs. To ſtrengthen this conjecture, he arranged the apparatus with the gold cones, as before, with pure water, and after a quarter of an hour no change was produced. On introducing into the cones a bit of glaſs, however, the fluid in the negative cone became highly ſenſible to turmeric paper. Mr. Davy here obſerves, that he had in every experiment a portion of nitric acid formed, and in quantity proportionate to the length of time the proceſs was continued. It appears alſo that ammonia was produced at the ſame time, but its limit was ſoon attained.

Suppoſing theſe reſults to ariſe from the nitrogen of the common air exiſting in the water, he repeated the experiments under the receiver of an air pump, exhauſted to $\frac{1}{64}$ of an atmoſphere. In 18 hours no ſigns of alkali were obſerved, but the acid in the oppoſite cone gave a perceptible red tinge to litmus paper. On repeating the experiment in an atmoſphere of hydrogen gas, he did not perceive any ſigns of acid or alkali. Hence he concluded, that the nitrous acid and the ammonia had owed their formation to the water, and the nitrogen of the atmoſpheric air.

The numerous important facts brought to light by the above inveſtigation induced Mr. Davy to extend his enquiries, particularly ſo far as related to the transference of the elements of compound bodies by the Galvanic proceſs.

He took two cups of compact ſulphat of lime, into which he introduced pure water, and connected them, as in the above experiments, with amianthus previouſly moiſtened: into each cup was introduced a platina wire connected with a battery of 100 pairs of ſix-inch plates. In five minutes the liquid in the poſitive cup, or that connected with the zinc end, became acidulous, and the other contained lime. Two ſimilar cups of ſulphat of ſtrontian afforded a ſimilar reſult, the earth being found pure in the negative cup, and

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the acid in the pofitive. In a fimilar manner veffels of fluat of lime afforded lime and fluoric acid.

On trying the fame experiment with fulphat of barytes, he found that the acid and bafe were more obftinate in giving way to the electrical power. By ufing a greater power, however, in four days he obtained portions of the earth and acid.

He then made a number of experiments with different mineral fubftances, which by analyfis afforded alkali or acid. His firft experiment was upon the fine grained bafalt, from Portrufh, which by analyfis afforded foda, muriatic acid, and lime. Two cups were expofed as in the laft experiment. In ten hours oxy-muriatic was found in the pofitive cup, and foda and lime in the other. The mineral called lapidolite gave potafh in this way; and a piece of vitreous lava from Ætna gave lime, potafh, and foda.

From the refults produced upon infoluble bodies, it was natural to expect that fimilar decompofitions and transfers would take place with the foluble faline compounds. The fubftances to be operated upon were diffolved in water, and introduced into the two agate tubes mentioned in the firft experiments, and the connection formed between them by moiftened amianthus. The bafe of the falt was transferred to the negative cup, and the acid to the pofitive. The falts which Mr. Davy employed, and which underwent this change, were fulphats of potafh, foda, and ammonia, nitrats of potafh and barytes, phofphat of foda, the fuccinat, oxalat, and benzoat of ammonia, and a folution of alum

The muriats, when fubjected to this procefs, afford oxy-muriatic acid. This was occafioned by the oxygen of the water, which was decompofed at the fame time.

When a folution of a number of compatible falts was expofed in the agate cups, all their bafes were transferred together to one fide, and the acids collectively to the other, without any regard to their order of affinity.

The decompofition appears to have been more compleat in the metallic falts, fince the oxyd of the metal is alfo decompofed; the oxygen and the acid arranging themfelves around the pofitive wire, and the metal in cryftals adhering to the negative wire. Mr. Davy afcertained, that in thefe experiments the decompofition was capable of being compleat. In an experiment made with fulphat of potafh no acid was found in the alkaline cup, nor any trace of alkali in the acid one.

Here Mr. Davy alludes to an experiment made by Mr. Gautherot, Annales de Chimie, vol. xxxix. page 203, in which he obferved that the oxyd of zinc was transferred to the negative wire. Another fact is alfo mentioned by M. M. Hifinger and Berzelius, in the fame, vol. li. page 171. They had in one leg of a fyphon a folution of muriat of zinc, and in the other diftilled water, the former leg being connected with the pofitive fide of the battery, and the latter with the negative. The diftilled water, after a certain time, they found to contain lime.

Mr. Davy took a cup of agate and another of fulphat of lime, into which he introduced diftilled water, and connected them as in the former experiments, the agate cup being made negative. In four hours the diftilled water in the agate cup contained lime, and the other had an excefs of fulphuric acid. The order was now reverfed, when it was found, in a fimilar length of time, that the agate cup contained fulphuric acid, and the other an excefs of lime.

In order to afcertain whether it was effential that the wires from the battery fhould be in abfolute contact with the faline folution, he filled two glafs tubes with diftilled water, and placed between a third veffel, containing a folution of muriat of foda, the furface of the latter fluid being lower than thofe of the water in the tubes. The wires were brought into the tubes containing pure water, and in fixteen hours the pofitive tube became ftrongly acid, and the other very alkaline, with muriatic acid and foda.

Finding the acid and alkali to be really tranfmitted from the middle veffel, through the pieces of amianthus, to the wires in the tubes, he filled one of the tubes with a folution of fulphat of potafh, and the other with diftilled water: the middle veffel contained diftilled water tinged with litmus. Some flips of moiftened litmus paper were placed above and below the amianthus in the circuit. The connection being formed, making the faline tube negative, the rednefs began to appear on the pofitive fide of the arrangement, and gradually diffufed itfelf to the middle of the intermediate veffel; but no change took place on the negative fide, although the acid had been all the while paffing from the negative to the pofitive fide. The order was now reverfed, making the faline folution to occupy the pofitive fide; but inftead of litmus, turmeric was employed in the intermediate veffel. The alkali exhibited the fame myfterious appearance in its paffage from the pofitive to the negative fide. The turmeric became brown on the negative fide only, while the pofitive fide of the intermediate veffel underwent no change.

In another experiment two glafs tubes were filled with a folution of muriat of foda, and the intermediate veffel with fulphat of filver. Turmeric paper was placed on the pofitive fide, and that of litmus on the negative: as foon as a communication was formed, foda began to appear in the negative tube, and oxymuriatic acid in the pofitive tube. In the intermediate veffel the muriatic acid marked its effects on the pofitive fide by a denfe precipitate, and the foda was diftinguifhed on the other fide by producing a lighter precipitate.

In the firft of the two laft experiments, it appears that the acid paffed through the litmus, and the alkali through the turmeric, without producing any vifible effect upon them; and in the fecond the muriatic acid had paffed through fulphat of filver without producing any precipitate, which tends to prove that the power by which the transfer is effected exceeds the chemical affinity of the bodies, which fhould on this occafion have been exerted. Several ftriking experiments were made to clear up thefe apparent anomalies. Into one of the tubes ufed in the laft experiment was put a folution of fulphat of pot-afh, into the other pure water, and into the intermediate veffel a weak folution of ammonia. The faline folution being placed on the negative fide, and the connection formed, the acid foon became vifible in the pofitive tube, fo that it appears the power of transfer was greater than the affinity of ammonia for fulphuric acid. This experiment was varied by ufing ftrong and even faturated folutions of potafh and lime with fimilar refults. In other experiments alkalies and earths were tranfmitted through acid folutions in the intermediate veffel. It does not appear, however, that this power is adequate to the force of combination in all inftances. Mr. Davy found that barytes did not pafs through fulphuric acid without producing fome fulphat of barytes, and the fame took place when the acid was attempted to be paffed through a folution of barytes; fimilar effects took place with ftrontian and fulphuric acid.

It was obferved that the metallic oxyds were transferred with more difficulty than the alkalies and earths.

In an experiment in which the green fulphat of iron was placed in the pofitive tube, pure water in the negative, and a folution of muriatic acid intermediate, in ten hours the green oxyd of iron began to appear upon the connecting amianthus,

amianthus, and in three days it was in the negative tube. Similar results were observed with solutions of copper, lead, and tin.

When Mr. Davy made various animal and vegetable substances the connecting media instead of amianthus, he found that the elements of the saline bodies which they contained were transferred. Thus he found that a leaf-stalk of the polyanthus afforded nitric acid in the positive tube, and soda in the negative; and a piece of muscular flesh afforded muriatic acid and soda.

The result of these experiments appears to shew, that the decomposition of bodies employed arises from their different elements being attracted to the wires or other metallic substances connected with the ends of the Galvanic battery. When saline bodies are decomposed, the acid is attracted to the positive wire, and the base to the negative. If acids or other oxyds be subjected to the same process, the oxygen is attracted to the positive side of the battery, and the inflammable base to the negative.

Mr. Davy succeeded in producing similar results of transference by common electricity. In the electrical current the same arrangements were observed with respect to the transference. The acids and oxygen wire attracted that connected with the conductor, and which is positive; while the inflammable bases and the bases of salts were attracted to the side connected with the negative conductor.

It had already been discovered by Bennet and Volta that when certain bodies were brought in contact, a disturbance of electricity took place, by one of the bodies giving some of its electricity to the other, and thus rendering one of them redundant or positive, and the other deficient or negative. Bennet found that when two flat polished plates, one of zinc, and the other of copper, were brought in contact face to face, the zinc received a portion of electricity from the copper. The plates were provided with insulating handles, and when they were separated as quick as possible, the relative states of electricity acquired by contact were rendered apparent by the sensible gold leaf electrometer, invented by the same ingenious philosopher.

It was afterwards discovered by Volta that the disturbance of electricity took place from the contact of different fluids with metals, and it was on this principle that he endeavoured to explain the energy of the pile which he invented, and the effects produced in the experiments of Galvani.

Mr. Davy, with much ingenuity and great industry, has resumed this enquiry, by observing the electrical changes arising from the contact of many different bodies.

He found that when an alkali was in contact with a metal, the latter gave some of its electricity to the former. But an acid in a similar situation gave its electricity to the metal. In the first instance the metal became negative, and the alkali positive; but in the latter the metal was positive, and the acid negative. It was on this principle that Mr. Davy constructed a pile with one metal only, by placing an alkali, or what is better, a sulphuret of an alkali on one side of the plate, an acid on the other side, and water between each stratum of alkali and acid. By this means one side of the plate was negative, and the other side positive, similar to a compound plate of different metals.

Mr. Davy made an attempt to establish the relative quantities of electricity produced by the contact; but he did not succeed with any other bodies than such as were perfectly dry. Those, however, which he did make were very conclusive, and tended much to substantiate the theory he had projected.

The solid and dry acids, either in powder or in crystals, when brought into contact with metals, become themselves negative, by giving their electricity to the metal, which, in consequence, become positive: such of the earths, and such of the alkalies as could be obtained dry, were tried upon metal. Lime, strontian, magnesia, and soda, by contact with metal, became positive, and the metal negative: sulphur, by contact with metal, becomes positive, and the metal the contrary. Mr. Davy found that sulphurated hydrogen became positive, and that the oxymuriatic acid became more negative than the common muriatic acid; and hence infers, that the contact of oxygen and hydrogen must render the hydrogen positive, and the oxygen negative.

It was fair to conclude, that when bodies undergo different changes, with respect to the same body, they must produce some effect on each other. He found dry oxalic acid become negative with lime, which it rendered positive: the same must necessarily follow between the acids and alkalies.

We may infer from this theory, that any two bodies are opposed to each other in their electrical energies, in proportion as one becomes negative and the other positive, when they are brought in contact; and that, if we are to reason from the common phenomena of electrical attraction and repulsion, we may expect that those bodies, which produce the greatest change upon each other, will have the strongest attraction for each other. If the bodies, by contact, produce no change, we may infer that they will have no attraction for each other; but that if the positive or negative parts of two bodies, by contact, be presented to one in the same state, they must absolutely repel each other. All this has been shewn to be the case in the experiments of decomposition of transfer.

Mr. Davy supposes, with much plausibility, that the relative states of the electricity of bodies may be the cause of chemical affinity, and of composition and decomposition. It appears that bodies which have a strong affinity for oxygen, are, in their electrical states, strongly opposed to that body. It also happens that acids, which combine with earths, alkalies, and metallic oxyds, are in a contrary state to the latter bodies. Another strong proof of the truth of this doctrine is, that the chemical affinity of bodies is altered by altering their electrical states. Thus, platina precipitates copper from its solutions when the platina is rendered negative; because the copper in that situation becomes more negative, and, in consequence, has a less affinity for oxygen. If, in the Galvanic circuit, zinc be made negative, it does not combine with oxygen, even if an acid be present. On the contrary, silver, being in a situation where it becomes positive, acquires the power of decomposing water.

From these facts, and their conclusions, Mr. Davy has pointed out a path, which has already led to very important discoveries. The elements of every compound, it is fair to conclude, are in different states of electricity, so long as they exist in combination. If, therefore, by the artificial application of electrified surfaces, the elements of the compound are more strongly and truly attracted by such surfaces than they attract each other, a decomposition of the body must be effected. And since this artificial power can be accumulated to any extent, we may, with great confidence, expect that the ultimate elements of bodies may some time be known.

Mr. Davy did not lose much time in applying the principles he had already laid down. His first experiment was upon potash, a substance long suspected by many chemists to be a compound. His first trial was upon a solution of alkali, but without success: he then tried it in a state of igneous fusion. The potash was fused in a platina spoon, and was connected with one side of a powerful battery, while a pla-

tina wire was made to touch the ignited alkali. A violent action took place; a brilliant light was observed on the negative side, as if some combustible matter were produced, and burned as it was evolved; when the spoon was negative, aeriform globules were seen to rise to the surface, and inflame on contact with air. He then made use of potash, slightly moistened by exposure to the air: the potash was placed upon a plate of platina connected with the negative side of the battery, and a platina wire from the other end of the battery was brought in contact with the upper surface of the potash: a violent effervescence took place about the wire at the upper surface; no gas appeared on the under surface; but small globules, having high metallic lustre, and the general appearance of quicksilver, began to appear. Some of these globules burnt in the air with explosion, and bright flame; others remained, becoming tarnished, and ultimately covered with a white film. These metallic globules proved to be the substance for which Mr. Davy was in search, and which appears to be the base of the alkali; so that it appears potash consists of oxygen, united to a peculiar inflammable base. This decomposition was, therefore, effected in consequence of the oxygen of the alkali being attracted to the positive wire, and the inflammable base to the negative side. (See Potash and Alkali, and Phil. Transf. for 1808, part i. page 1.) By a similar process, Mr. Davy decomposed soda, ammonia, and several of the earths; resolving them, into oxygen and peculiar inflammable bases.

An extensive field is here opened for chemical research, too vast for human conception, by the introduction of this powerful agent. More discoveries have been made in one year, than, perhaps, any one century can boast.

Having given an historical account of the most prominent facts of Galvanism, chiefly drawn from the detailed essays of the discoverers, we shall now proceed to the investigation of the best means of exciting Galvanic energy, and the construction of Galvanic apparatus. This part, however, we shall preface, with detailing some preliminary experiments, calculated to throw light upon the principles of this intricate subject, as well as to point out the best means of examining those bodies fitted for the production of Galvanism. Bennet was the first who discovered that a certain number of bodies, when brought into contact, caused a disturbance in their latent electricities: for instance, if a plate of copper be brought in contact with a plate of zinc, a portion of electricity is transmitted from the copper to the zinc, rendering the latter positive and the former negative. If the plates have insulated handles, they may be separated, and their respective states may be shewn by Bennet's electrometer. When it was discovered that silver and zinc, or copper and zinc, were the best exciters of Galvanism, Volta, the discoverer of the pile, took advantage of the above fact to explain the phenomena. In the arrangement of the pile, which consisted of a certain number of pairs of plates of silver and zinc, with plates of wet cloths interposed between them, he considers the electricity generated by the contact as constituting the whole of the energy of this apparatus, the fluid of the wet cloths being a mere conducting medium from one pair of plates to another. Volta, however, himself acknowledges, that when he made use of water as the connecting medium, he had the same quantity of electricity indicated by the electrometer, as when the interposed fluid contained common salt, although the shock, in the first instance, was scarcely perceptible, while, in the latter, it was very severe.

Mr. De Luc has lately published an account in Nicholson's Journal, which is to be continued, in which he has proved that the quantity of electricity indicated by the electrometer formed almost an imperceptible part of the Galvanic effect. Mr. Davy, in his account of the chemical agencies of electricity, already given, has endeavoured to account for the Galvanic effect on the principle of contact, without allowing any of the effect to the chemical actions of the substances employed. He considers the first effect to be produced by the contact of the dissimilar metals, the zinc acquiring excess, and the copper becoming deficient. The elements of the water employed, he supposes, are in the same unequal state, by being in combination; the oxygen being deficient or negative, and the hydrogen redundant or positive. If a neutral salt be employed he also supposes that the acid and alkali are differently disposed in their electrical tendencies by the former being negative, and the latter positive. Accordingly, therefore, in such an arrangement, there would be the united electrical energy of the acid, of the salt, the oxygen of the water, and the copper plate, all of which are negative. These would be opposed to the positive powers of the base of the salt, the hydrogen of the water, and the zinc plate. He supposes that during the action of a battery consisting of the above arrangement, the chemical action, so far from being the cause of the electrical energy, may be considered as the means of restoring the equilibrium between the bodies in different states. The oxygen deserts the hydrogen to combine with the zinc, forming oxyd of zinc, thus destroying the negative state of a quantity of oxygen, and the positive state of a quantity of zinc. The hydrogen repairs to the copper, which is in a contrary state to itself. This contact lessens the negative state of the former, and the positive state of the latter. In this state of the process the base of the salt and the oxyd of zinc are attracted to the copper surface, while the acid of the salt is attracted to the zinc plate; the former tending to annihilate the negative state of the copper, and the latter the positive state of the zinc plate.

If an acid be present in the fluid instead of a salt, which is capable of decomposition, its elements are in contrary states, and have an effect similar to the water; but if the acid is not decomposed, it can only contribute to the process by dissolving the zinc. In the electrical experiments of Mr. Davy, he has shewn that acids and oxygen become negative by being brought in contact with alkalies, earths, and inflammable matter, in the same way that certain metals alter their states. In the experiments of Bennet and Volta we are disposed to place the greatest confidence. At the same time, however, we cannot believe that so small a quantity of electricity can be capable of producing the powerful effects produced by Galvanism. We shall detail some experiments which will prove that the Galvanic process depends in a great measure upon the chemical agents employed, and that in no instance is Galvanism produced without water. A metallic surface is capable of oxydation, and another metallic surface is kept free from oxydation, at the same time when the two metallic surfaces are unconnected. The electricity produced by the contact of bodies appears to be quite distinct from that produced by the chemical process, and may be ascertained by the electrometer. In a Galvanic series, composed of fifty pairs of plates of zinc and copper, with a fluid medium of pure water, the electricity, as measured by the electrometer, will be just the same as if a quantity of muriatic acid were added to the water. Yet in the first instance no perceptible Galvanic effect will be perceived, while in the latter a very severe shock may be felt.

According to Mr. Davy's doctrine the electrical energies are the same in both instances, since the acid is not decomposed, and of course cannot contribute to the effect. If it therefore does no more than dissolve the oxyd of zinc, it can only

only be faid to keep up the original energy, and therefore the firft effect of both muft be the fame, which is contrary to the fact. Agreeable to this hypothefis, a folution of a neutral falt ought to produce the greateft poffible Galvanic effect from the additional agency of the oppofite electrical ftates of the acid and alkali. Mr. Davy afferts that in the firft inftance the effect is greater, but that in a little time the alkali gets to the copper plate, and tends to deftroy its negative ftate, and in confequence the energy becomes much weakened or deftroyed. As a proof of this, he obferves, that if the trough be fhaken, fo as to mix the different fubftances in the cells, the power becomes much revived. Several affertions here are not fupported by fact. In the firft place no faline folution, even in the firft beginning, produces fo great an effect as a free acid, diluted with water, particularly the nitric acid.

Mr. Davy would account for the great effect of the nitric acid from the acid undergoing decompofition. From fimilar reafonings nitrat of potafh fhould produce the greateft effect poffible, becaufe both the falt and the acid are decompofed. This, however, does not agree with experience, fince muriat of foda produces a greater effect than nitrat of potafh, although the latter, confiftent with Mr. Davy's hypothefis, fhould produce a greater effect than nitric acid, by the additional electrical power of the acid and the alkali.

With refpect to the permanence of the effect, it will be found in practice that acids which produce the greateft effect in the firft inftance are the leaft permanent, and that faline folutions, which act upon zinc very flowly, are found to be more permanent. Thofe falts will be found moft efficacious which form triple falts with zinc. Hence the reafon why muriat of foda acts more powerfully than nitrat of potafh, and why muriat of ammonia is ftill more energetic than muriat of foda, fince it oxydates, and combines with metals with very great facility. There are other facts which militate ftrongly againft Mr. Davy's theory: the free alkalies are found to have a greater Galvanic effect than the neutral falts. A folution of cauftic of potafh is much more powerful than any falts formed with that alkali. This may be accounted for from the facility with which alkalies diffolve moft oxyds of metals. Independent of the proofs already brought forward, we fhall introduce fome experiments which cannot fail to demonftrate that the phenomena of Galvanifm do not depend upon the flight electric effects produced by contact, but upon the chemical action of the bodies employed. Mr. Davy, in the paper to which we have before alluded, obferves, that if electricity were produced during chemical changes, it ought to be appreciated by the electrometer; but till we are better acquainted with the connection between electricity and caloric, the latter of which is always difturbed during chemical change, nothing conclufive can be drawn from fuch argument. Mr. Davy mentions another experiment to prove that the Galvanic effect is not the refult of the chemical effect. He ftates that in the Galvanic combination of zinc, copper, and nitric acid, the zinc is pofitive. But on a combination of zinc, nitric acid, and water, the fide of the zinc next the acid is negative. If, he obferves, the Galvanic effect was dependent on the chemical action, the zinc would be pofitive in both inftances. That the zinc in contact with the nitric acid is negative, Mr. Davy's own experiments and reafoning contradict. The very contact of the acid, by his own hypothefis, ought to make the zinc pofitive, which would alfo tend to increafe its affinity for oxygen. Perhaps in all cafes in which water is decompofed by the agency of a metal and an acid, the advantage of the prefence of the acid may in this way be accounted for.

Galvanic Combinations.—No fubftance can poffibly enter into any Galvanic combination except it be a good conductor of electricity. The moft common and fimple Galvanic combination confifts of two furfaces of diffimilar metals and a fluid containing oxygen placed between them. One of the metals fhould be fufceptible of oxydation by the fluid, and the other lefs fufceptible of oxydation by the fluid. A communication made between the two metallic furfaces, either by bringing the metals together, or by connecting them by a metallic fubftance, will fhew the effect of the combination by fuch tefts as will hereafter be mentioned. A Galvanic combination, as Mr. Davy has fhewn, may be formed of one metal only, by its being fo fituated that one part of it may undergo oxydation in a greater degree than the other. This Mr. Davy effected by placing dilute nitrous acid on one fide of the metal and fulphuret of potafh on the other, having a ftratum of water between the fluids. Well-burnt charcoal and plumbago are found to have the fame effect with metals in Galvanic combinations. The moft fenfible teft of any Galvanic combination is the mufcles of a recently killed frog: if the limbs are placed in the circuit, which connects the two metallic furfaces, at the fame time the metals touch one another, the mufcles are violently convulfed. If the metals be in any degree diffimilar between which the limbs are placed, at the fame time that the part is moiftened with water, convulfions will be perceived as often as a metallic communication is made between the diffimilar metals. If the tongue be made to touch the two metals which form a Galvanic combination, at the fame time that the metals are brought in contact, a tafte will be perceived, not much unlike that of an acid: and if the metals be very diffimilar, fuch for inftance as filver and zinc, at the moment of contact, a flafh of light will be perceived fimilar to that produced by a blow about the eye. In fpeaking of Galvanic combinations in future, we fhall call that metallic furface which is undergoing oxydation the pofitive furface; the other metal, which muft be lefs fufceptible of oxydation, we fhall denominate the negative furface; and the oxydating medium, the interpofed fluid.

In afcertaining the power of any Galvanic combination we fhall make ufe of a teft different from either of thofe above-mentioned, fince it will be found more convenient and regular. It was difcovered by Dr. Wollafton, as we have before ftated, that in every Galvanic combination, the negative furface, fo long as the circuit is complete, is obferved to give out bubbles of gas, which is found to be hydrogen, but that this gas ceafes to be evolved as foon as the metals are feparated. The moft convenient way of making thefe experiments, is with wires of the metals: the fluid in which the wires are immerfed fhould confift of water, containing $\frac{1}{10}$th or $\frac{1}{12}$ of muriatic or fulphuric acid. The wires are firft put into the fluid, and kept feparate. The zinc will be violently acted upon by decompofition of the water, but the leffer oxydable wire, if of platina, gold, filver, copper, or brafs, will not exhibit any change. If, however, the ends of the wires out of the liquid be brought into contact, an abundance of gas will be evolved from the negative wire. Zinc, with platina, gold, filver, and palladium, affords the greateft quantity of hydrogen from the negative wire during contact. Zinc with copper the next. Zinc with iron very little lefs than zinc with copper. By gueffing at the quantity of gas given out from the negative furface in different combinations, we have in the following table fome idea of their relative power. The maximum is made 10, and a quantity of bubbles, which could juft be defcried by a magnifying glafs, is called 1.

Pofitive

Positive Metal.	Negative Metal.	Interposed Fluid.	Effect produced.
Zinc.	Platina.	Dilute sulphuric acid.	10
Ditto.	Gold.	Ditto.	10
Ditto.	Silver.	Ditto.	10
Ditto.	Palladium.	Ditto.	10
Ditto.	Copper.	Ditto.	8
Ditto.	Iron.	Ditto.	7
Iron.	Platina.	Ditto.	3
Ditto.	Ditto.	Dilute Nitric Acid.	3
Ditto.	Copper.	Dilute sulphuric acid.	None.
Tin.	Platina.	Ditto.	4
Ditto.	Copper.	Ditto.	None.
Ditto.	Iron.	Solution of Caustic Potash.	1
Ditto.	Copper.	Ditto.	½
Ditto.	Platina.	Ditto.	2
Zinc.	Ditto.	Ditto.	3
Ditto.	Copper.	Ditto.	2
Ditto.	Antimony.	Dilute sulphuric acid.	2
Ditto.	Bismuth.	Ditto.	4
Ditto.	Platina.	Nitric acid.	10
Ditto.	Copper.	Ditto.	8
Tin.	Platina.	Ditto.	3
Copper.	Ditto.	Ditto.	1
Silver.	Ditto.	Ditto.	¾

We are under a necessity of referring the further account of this subject to the article VOLTAISM.

GALVEAS, in *Geography*, a town of Portugal, in the province of Alentejo; 24 miles W.N.W. of Estremoz.

GALVETTES, in *Navigation*, ships of war in the East Indies, on the Mahratta coast, which are constructed for carrying four, and sometimes six guns. Their chief employment is to scour the coasts of a class of pirates, named "Chamchas," who fally from the bottom of the gulf of Guzurat, and commit depredations upon trading vessels which they happen to surprise in those seas..

GALVEZIA, in *Botany*, so named by the unfortunate Dombey, in honour of the Spanish minister for Indian affairs Don Galvez, who was concerned in his appointment, and who alone of all those who had it subsequently in their power to do him justice, testified any inclination to relieve his distress; by offering him a sum of money, which however was not accepted. See DOMBEY. Juss. 119. Class and order, *Didynamia Angiospermia*. Nat. Ord. *Personatæ*, Linn. *Scrophulariæ*, Juss.

Gen. Ch. "*Cal.* Perianth small, inferior, in five segments. *Cor.* tubular, somewhat swelling at the base; limb of two lips, the upper two-lobed, the lower deeply three-cleft. *Stam.* not prominent beyond the corolla. *Stigma* one. *Peric.* Capsule globose.—A branching shrub, found in Peru, with alternate *leaves*, and solitary, axillary *flowers*." *Jussieu*, from his own herbarium and the manuscripts of Dombey.

GALUPPI. See BURANELLO.

GALUTA, in *Geography*, a town of the Arabian Irak; 5 miles N. of Shehrban.

GALWAY, a very large county of Ireland, in the province of Connaught, which is inferior in size only to the county of Cork, but the last in population of the thirty-two. It lies immediately south of Mayo, which, with part of Roscommon, forms its northern boundary; on the east it has the county of Roscommon, the King's county, and county of Tipperary; on the south, the county of Clare, and Galway bay; and on the west, the Atlantic ocean. It extends 43 Irish miles (54½ English) from north to south, and 76 Irish (96½ English) miles from E. to W. containing 989,950 acres, which are 1546 square miles Irish (in English measure 1,739,591 acres, or 2718 square miles). In this vast tract are only 116 parishes, which contain, on an average, 8534 acres each. Yet there are only 28 benefices, and as many churches, which would give upwards of 35,000 Irish acres to the care of each rector! These parishes are in the archbishopric of Tuam, and the bishoprics of Clonfert, Kilmacduagh, Elphin, and Killaloe. The number of houses in the county of Galway, according to the last official return of the inspector-general of hearth-money in 1791, was 24,268, though Dr. Beaufort has given it as 28,212; above 20,000 of which number are exempt from the hearth-tax. Reckoning the population at six to a house, it will be about 145,000, or one person for near seven acres. "This very scanty population," says Dr. Beaufort, "may be, in some measure, accounted for, by the rude state of the three baronies on the west of lough Corrib, which amount to a third part of the county." The extensive country on this side of the lake, according to the same writer, (almost the only authority to be relied on respecting this county, and from whose memoir, therefore, the present article is chiefly extracted,) is flat, with the exception of a few fertile hills of no great height, and some low mountains on the borders of Clare. The soil is warm and fertile, covering, at no great depth, a stratum of lime-stone rock, which, in the parts adjoining the county of Clare, rises so thick above the surface as to render those parts unfit for tillage, though they are excellent for pasture. The richest part of the county is between Loughren and Portumna, thence to Eyrecourt, Clonfert, and Aghrim. Few ditches are to be seen in Galway, the fields being chiefly inclosed with dry stone-walls, which gives the country a dreary aspect. The western part of the county is of quite a different character from the rest. The district called Jarconnaught contains some good land on the sea-coast, and along the beautiful shore of lough Corrib. But the heart of this district is an assemblage of unreclaimable rock and mountain; and beyond Oughterard, mount Leam stands very high above the lake. The rocks at Oughterard, and in the bed of the river Fuogh, of which there are immense masses, are all a black and white marble, equal, at least, in beauty, to that of Kilkenny; yet, when Dr. Beaufort wrote, there was seldom employment for more than one solitary artist, in working up a few chimney-pieces. Lough Corrib somewhat resembles lough Erne in its form, and extends 20 miles in length, being

being 11 wide in the broadeſt part: in the middle it is contracted to a ſmall channel, which is croſſed by a ferry at Knock. The large barony of Ballinahinch, which is better known by the name of Connamara, abounds with fine harbours, but is alſo extremely mountainous. The hills of Ourred and Caſhel are very high, and the vaſt ridge called Beanbeolla, or the Twelve Pins, which is a well known ſea-mark, conſiſts of almoſt perpendicular rock. At the foot of this ridge, cloſe to the little village of Ballinahinch, a charming lake ſpreads itſelf for ſome miles; and on the river which runs from it into Roundſtone bay, there is a great ſalmon fiſhery. On the ſides of hills, and in the valleys, which are watered by rivers and ſmall lakes, and ſheltered, in ſome places, by the venerable remains of ancient woods, the ſoil is moſtly inclined to a black bog; but gravel, ſand, or rock, lie at no greater depth than from one to three feet below the ſurface. Great quantities of kelp are made all along the coaſt, and, by manuring with ſea-wrack, the land is rendered very productive to the ſcattered families that inhabit it, who are all little farmers and hardy fiſhermen. The northern part of this diſtrict is called Joyce's Country, and is chiefly inhabited by a clan of that name. It is alſo extremely rough; Mamtraſna, on the borders of Mayo, is very high, and Ben-Levagh, at the north-weſt angle of lough Corrib, is a ſtupendous mountain. Yet the borders of the lake, the ſhore of Killeries, and the valley through which the river Bealnabrack runs, are pretty well peopled, and the ſoil ſuch as would amply repay the pains and expence of good cultivation. This county does not appear, from the report of Mr. Donald Stewart, itinerant mineralogiſt to the Dublin Society, to promiſe much addition to the mineral treaſures of Ireland. Lime-ſtone and marle are, indeed, valuable to the agriculturiſt, and theſe are in abundance; but the only ores ſeem to be lead and mangancſe; and there is little proſpect of coal. The lead is moſt abundant in the mountains near lough Corrib. A very particular account of the rare plants found in this county, and eſpecially the wild weſtern diſtrict, was publiſhed by Dr. Wade, profeſſor of botany to the Dublin Society, in the Tranſactions of that body. To detail all of them would be tedious; but it may be uſeful to notice a few of the moſt uncommon. Aſperula cynanchia, galium boreale, alchemilla alpina, rhamnus catharticus, pimpinella magna, droſera anglica, erica daboecia (very common) andromeda polifolia, arbutus uva urſi, ſaxifraga umbroſa, and hyperoides, cratægus arica, ſorbus aucuparia, myagrum ſativum, lavatera arborea, lobelia dortmanni, are found there, with a great variety of cryptogamics. This county, which reaches from the ſea to the Shannon, is well watered by rivers and lakes: ſeveral of the rivers are, in part of their courſe, ſubterraneous. The Black river, on the bounds of Mayo, dips for about three miles near the village of Shrule. The Clare and the Moyne unite their waters under ground, alternately appearing and retiring from view in the Turlachmore; which, in winter, form a lake, and in ſummer a beautiful and ſound ſheep-walk, upwards of ſix miles in length, and two in breadth. Near Gort there are a vaſt number of theſe ſwallows; in which ſome part of almoſt every river and brook in the neighbourhood is ingulphed. The river Gurrnamakin dips ſeveral times, and, after a concealed courſe of two miles, riſes on the beach below high water-mark, and diſcharges itſelf among the rocks in the bay of Kinvarra. Lough Rea is a fine piece of water; and lough Coutra, near the borders of Clare, is ſaid to poſſeſs all the beauties that hills, woods, and iſlands can impart to water. The maritime advantages of this county muſt not be omitted. The vaſt bay of Galway is ſheltered at the entrance by the three ſouthern iſles of Arran. The ſound between theſe iſlands is a ſafe road; and a number of inlets on the coaſts, as well as the harbour of Galway, are ſufficiently deep for the reception of merchant ſhips; but are more frequented by coaſters and fiſhing-boats, than by veſſels in the foreign trade. The indented ſhores of Connamare abound in well-ſheltered havens. With reſpect to the agriculture of Galway, it is ſaid that tillage is rapidly increaſing: the ſoil, as before obſerved, is naturally fertile; manures are abundant; and their agriculture tolerably judicious. We here find moſt of thoſe practices, which have long diſgraced the huſbandry of the weſtern counties, no more ſtubbornly purſued; the reſident landholders generally ſet examples of enlightened tillage in their reſpective demeſnes; and, in addition to lime-ſtone, lime-ſtone gravel, and marle, ſea-wrack, and even fern and other weeds, which the inhabitants collect and rot, prove good manures. The fruits of labour are rich crops of oats, barley, potatoes, and ſometimes wheat. But the climate of this hilly and weſtern region is too variable, humid, and tempeſtuous even to permit crops of grain to grow and ripen here, ſo happily as in the ſouthern and eaſtern parts of Ireland. Nor have the inhabitants of Galway acquired thoſe vigilant and enlightened habits of induſtry ſo eſſentially requiſite to enſure ſucceſs to their mode of huſbandry. The linen manufacture has of late years increaſed in this diſtrict, eſpecially near lough Rea, and bleach greens in proportion. The fiſheries on the coaſt alſo add conſiderably to the means of employment and ſupport. The villages in the eaſtern part are numerous and cheerful, but in the higher, or weſtern regions, there are very few, and theſe the abode of poverty and miſery. Nothing, however, ſtrikes a ſtranger more forcibly than the vaſt number of old caſtles and churches in ruins, or on the brink of decay, that occur in this diſtrict, "pourtraying," ſays a late writer, "the warlike character of former inhabitants, their noble eſtabliſhments, their religious zeal, or the power of their chieftains, and inſpiring a train of reflections agreeably diſpelled by the numerous modern manſions, that direct to ſcenes of natural beauty, rural improvement, or to a tenantry enjoying the bleſſings of proſperity and peace. The county of Galway is repreſented in parliament by three members, two for the county, and one for the town of Galway. Beaufort's Memoir of Meſſrs. Robertſons' View of Ireland.

Galway, the chief town of the county of the ſame name in Ireland; and formerly, when each province had a diſtinct governor, the capital of Connaught. It is ſituated on the broad and ſtony river by which lough Corrib empties itſelf into the ſea. It does not cover a very large ſpace, but being very compact, and having little waſte ground within its ancient and mouldering walls, it contains a great number of inhabitants. They may be eſtimated at 12,000, though there are but 950 houſes; for the greater part of this ancient town conſiſts of ſquare edifices at leaſt 200 years old, with each a ſmall court in the centre. Several diſtinct families occupy theſe large houſes; an arched way, leading from the ſtreet to the court, with a ſtone ſtaircaſe on each ſide. The ſtreets are long and narrow. This was formerly the moſt commercial town in Ireland; but the ſpirit of enterpriſe has long ſince forſaken it; and though it has ſtill ſome commerce, it has been left behind by many other places. No veſſels come up as far as the town; but the goods are conveyed backward and forward by lighters. The linen manufacture, and the various fiſheries along the coaſt, are the chief employment of the inhabitants. The collegiate church, of which the conſtitution and privileges are unique in Ireland, is very large. The government of the town is placed in a mayor, ſheriffs, and recorder; and the freemen return a member to the imperial parliament. The public buildings in Galway, beſides

besides the collegiate church already mentioned, which is of Gothic structure, are an exchange, three nunneries, three monasteries, commodious barracks for two or three regiments of infantry, a charter school, and an hospital. Galway is a post and fair-town, and is situated 102 miles west from Dublin. N. lat. 53° 14'. W. long. 8° 5' from Greenwich. Beaufort. Robertson's Book of Roads.

GALWAY *Bay*, a large bay in the west of Ireland, twenty miles long, and seven miles broad, the north side of which has several shoals and blind rocks, some of which are called the stags of Arran, but the north side of it is safer. The three isles of Arran shelter the entrance, and cause no less than four passages into the bay.

GALWAY, a post town of America, in the county of Saratoga, New York; W. of Ballstown, and containing 2310 inhabitants.

GALYBE, in *Ancient Geography*, a town of Africa Propria, situated between the two Syrtes, according to Ptolemy.

GALZHA, in *Geography*, a town of European Turkey, in Bulgaria, on the Black sea; 10 miles S. of Varna.

GAMA, VASCO, VASQUEZ DI, in *Biography*, a celebrated navigator, was born at Synes, a maritime town in the Portuguese province of Alentejo, and being of an enterprising spirit he was devoted to the sea-service, in which he soon distinguished himself. When king Emanuel determined to push his discoveries in the East, Di Gama was fixed on to conduct the expedition. He accordingly set sail from Lisbon with a squadron of four small vessels in July 1497. Such, however, was the state of navigation at that time, that he was four months contending with contrary winds before he reached the Cape of Good Hope. At length he was fortunate enough to double that cape, which had hitherto baffled the attempts of all his countrymen, and which had been the constant object of their terror and anxious hope. Thence he proceeded along the south-east coast of Africa, till he arrived at Melinda; where he had the high satisfaction to find a people far advanced in civilization, and engaged in active commerce with the remote countries of Asia. Here he procured a Mahometan pilot, who conducted him to the Malabar coast, and on the 22d of May he arrived at Calicut. He was received in a friendly manner by the prince, and Gama conducted himself with so much prudence and resolution in his intercourse with the natives, that he was allowed to freight his ship with many of the most valuable productions of the East. At length the Mahometan merchants, jealous of his success, laid a plot for his destruction; upon the discovery of which Di Gama embarked with all his treasures, and returned to Portugal, where he was received with every testimony of gratitude and respect by the king and nation. He entered the port of Lisbon in September 1499, having had, however, the misfortune to lose the greater part of his crew by disease and fatigue. This expedition completely established the practicability of a new road to the Indies, and other naval commanders were sent out upon similar expeditions.

Di Gama was employed in a second voyage, in which he had the command of a considerable fleet, and was honoured by his sovereign with the title of admiral of the Indian, Persian, and Arabian seas. In the course of this voyage, which he commenced in 1502, he compelled tribute from, or an alliance with, the petty princes that he met with in his route: when he arrived at Cochin he received a deputation from the Christians of St. Thomas, to whom he promised protection. The prince, who began to be suspicious of the motives of his visitors, fitted out a fleet to intercept them in their course, hoping, no doubt, to put an end to their future projects; but Di Gama, understanding their intentions, began the attack with a degree of ardour little expected by the combatants, and boarded and took two of the largest ships, which proved to be prizes of immense value. After this success he returned, and landed at Lisbon in September 1503. The success of this voyage occasioned great rejoicings in Portugal, and the government set about the means of securing the establishments it had made in India, and of extending them by conquest. We hear little more of Di Gama till the year 1524, when he was prevailed on to undertake a third voyage, with the rank of viceroy of the Indies. He proceeded to Cochin, was victorious against the people of Calicut, who attempted to frustrate his designs, and achieved other things of importance, when he died December 25, 1525. He left two sons, Don Stephen and Don Christopher, who were afterwards viceroys of the Indies, and who are noticed with applause and honour in history. Robertson's Hist. of America. Mod. Univer. Hist.

GAMACHES, STEPHEN SIMON, was born at Meulan about the year 1672, and, being educated for the church, he obtained the office of canon of the Holy Cross de la Bretonniere, and acquired so much reputation by his proficiency in science and literature that he was elected a member of the French Academy of Sciences. He died in the year 1756 in the 84th year of his age, leaving behind him, besides other works, "Physical Astronomy," in two vols. 4to.; "Literary and Philosophical Dissertations;" "The System of a Christian Philosopher;" "The Elegancies of Language reduced to their Principles." This last has been recommended as deserving the perusal of every person who is desirous of a good style: it has been denominated "A Dictionary of fine Thoughts." Nouv. Dict. Hist.

GAMACHES, in *Geography*, a town of France, in the department of the Somme, and chief place of a canton in the district of Abbeville; 12 miles S. of Abbeville. The place contains 1037, and the canton 10,093 inhabitants, on a territory of 165 kiliometres, in 21 communes.

GAMALA, or GAMAL, in *Ancient Geography*, a town of Palestine, beyond Jordan, in the Gaulanitis, so called because, being situated on a high mountain, its form resembled that of a camel. It was part of the kingdom of Agrippa; but as the inhabitants refused to submit to him, it was besieged, first by the forces of Agrippa and afterwards by the Romans, who, after a long siege, took and sacked it. It was afterwards fortified, and taken by Vespasian, who put the inhabitants to death, precipitating many of them from the summit of the citadel. Herod repaired it, and changed its name into "Herodium," but the ancient appellation prevailed.

GAMALIBA, a town of India, on this side of the Ganges, mentioned by Ptolemy.

GAMALIEL, surnamed the *Aged*, in *Scripture Biography*, an eminent Jewish rabbi in the first age of Christianity, supposed to be St. Paul's master, and mentioned by him, Acts, xxii. 3, and in chap. v. 34, to be "one of the council, a pharisee and doctor of the law, had in reputation with all the people." Accordingly he appears from other testimonies to have been held in high estimation by the Jewish people, and he is often mentioned in the Mishna. We have ample evidence that Gamaliel was never converted to Christianity, as some Christians, especially of the church of Rome, have fondly and weakly imagined. Indeed, from the account given of him by St. Paul in the passage above cited, it may be argued that he was still a firm Jew; otherwise it had not been to the purpose to take notice of his education under him, in the critical circumstance in which he was then situated.

Gamaliel's argument in favour of the apoftles (Acts, v. 37, &c.), which fome interpreters have mifunderftood, is thus ftated by the judicious Dr. Lardner (Works, vol. i. p. 255.): Theudas and his meafures came to nothing. After him Judas rofe up; he himfelf perifhed, and his people were difperfed: but yet his principles prevail. You likewife may now punifh thefe men, and put an end to their lives; but if their principles be of God, they will prevail notwithftanding; and all the iffue will be, that you will contract guilt, fight againft God, but in vain. And to this feems to be owing the great fuccefs of Gamaliel's reafoning, and the fervice he did the apoftles at this time. He infinuates fome hopes, that their defign might be of the fame nature with Judas's. This may be inferred from his way of expreffing himfelf, "left haply ye be found to fight againft God." This was Judas's peculiar principle, that they were to own no mortal lords, but God only. And it is not unlikely, that Gamaliel intended hereby to infinuate, not only that there was danger of oppofing a defign which came from God, and of oppofing it with no other effect but that of contracting guilt to themfelves, but alfo of oppofing the very kingdom and government of God, to which they wifhed to be fubject. It deferves likewife to be obferved, that Gamaliel mentions Theudas with contempt and indignation: "Before thefe days rofe up Theudas, boafting himfelf to be fomebody." But nothing like this follows the mention of Judas. Gamaliel concludes, upon the whole, that they fhould "let thefe men alone." We have no occafion to meddle in this matter; it is not unlikely but the Romans, our prefent governors, will be jealous of thefe men. But it feems to me an affair, in which we have no reafon to concern ourfelves.

GAMAREA, in *Ancient Geography*, a fmall country of Media, according to Diodorus Siculus.

GAMAZE', in *Geography*, a town of Egypt; 12 miles N. of Atfieh.

GAMBA, *Ital. the leg;* as *viol di gamba*, a bafe viol, that refts on the *leg*, to diftinguifh it from *viola di braccia*, or a tenor viol, that refts on the arm.

GAMBACH, in *Geography*, a town of Germany, in the principality of Solms Braunfels; 2 miles W. of Munzenberg.

GAMBALONE, or Gambuolo, a town of Italy, in the department of the Upper Po.

GAMBARA, Lorenzo, in *Biography*, was born at Brefcia about the year 1496, and became diftinguifhed as a Latin poet. He acquired confiderable celebrity among his contemporaries, and is mentioned with refpect and honour by Manutius, Lipfius, Gyraldus, and others. He lived to the great age of ninety. His works are numerous, and they have paffed through many editions. Among his larger pieces, his "Columbus," a poem in four cantos, is the beft known. The fubject of it is, as its title imports, the difcovery of America, and it follows the order of events as they are recorded of the great navigator, without any decorations of fiction, and therefore is fcarcely to be admitted among the rank of epic poems. In his youth he had written a great number of poems which were evidently injurious to the caufe of morality: thefe, in his advanced years, he committed to the flames, and in his treatife "On the Art of Poetry," he not only condemns every thing injurious to virtue, but prohibits the ufe of heathen mythology. Moreri.

Gambara, Veronica, an Italian literary lady, was born at Brefcia in the year 1485. She received a good education, and was aided and encouraged in her literary purfuits by a correfpondence with cardinal Bembo. In 1509 fhe married Giberto, the lord of Corregio, with whom fhe lived nine years, and after his death fhe devoted her time and talents to the education of her two fons, and to the compofition of thofe works which have given celebrity to her name. In 1528 fhe fixed her refidence in Bologna, and at the time of the coronation of the emperor Charles V. her houfe was the refort of a number of the moft diftinguifhed characters in Europe, who followed that prince's court. She died at Corregio in 1550, and in 1559 her poems, which had hitherto been printed in varions collections, were publifhed with her letters in a complete edition at Brefcia. Gen. Biog.

Gambara, in *Geography*, a town of Italy, in the department of the Mela; 18 miles S. of Brefcia.—Alfo, a town of Italy, on the Brenta; 5 miles S. W. of Venice.

Gambara, a town of Italy, in the duchy of Piacenza; 24 miles S. of Piacenza.

GAMBASCA, a town of France, in the department of the Stura, feated on a fmall river which runs into the Po; 6 miles W. of Saluzzo.

GAMBESON, Gambeyson, *Gambefo*, in the *Ancient Military Language*, was a kind of coat or doublet, worn under the cuirafs, to make it fit eafy, and prevent its hurting the body.

It was made of wool or cotton, quilted between two ftuffs; and was likewife called counter-point.

Others define the gambefon a kind of foft quilted waiftcoat, worn under the coat of mail, and hanging down over the thighs.

"Pectora tot coriis, tot gambefonibus ornat."

GAMBET, in *Ornithology*, the Englifh name of Tringa *Gambetta*, which fee.

GAMBIA, in *Geography*, a country of Africa, which takes its name from the river that paffes through it; ceded to England by the peace of 1783. The river, called alfo Gambra and Gamba, empties itfelf into the Atlantic, and is fuppofed by fome to be a branch of the Niger. Its fource is not known, but it is navigable for floops 600 miles into the interior of the country. It annually overflows its banks like the Nile, and probably from the fame caufe. Its mouth is in N. lat. 13° 30′. W. long. 16° 30′.

GAMBIER's Islands, a group of fmall iflands difcovered by captain Wilfon of the Duff, in the miffionary voyage, May 1797; about 5 or 6 leagues in length, fituated N.E. by N. and S.W. by S. A reef, lying about three leagues from the largeft of thefe iflands, and probably encircling the whole group, extended as far as the eye could reach, on which were feveral dry fpots bearing clufters of trees. The inhabitants oppofed every attempt to land. The main ifland, and thofe about it are all high; and as the reef kept the fea calm about them, they prefented a romantic, though barren appearance. The vallies, however, were covered with trees. "Duff's mountains," fo called by Capt. Wilfon from the name of his fhip, are two lofty mountains, vifible at the diftance of fourteen or fifteen leagues, which lie in the centre, and are fituated in S. lat. 23° 12′. E. long. 225°.

GAMBINO, a river of Italy, formed by feveral ftreams, which run into the Oglio, near Torne d'Oglio.

GAMBLE's Station, an American fort, about 12 miles from Knoxville, in Teneffee.

GAMBOGE, or Cambogia *Gutta*, is a concrete, gummy, refinous juice of a certain tree growing wild in Cambogia or Cambodia, Ceylon, Siam, and Cochinchina, and called by botanifts "Stalagmitis gambogioides." The Siamefe gamboge occurs in fmall tears, formed by the concretion of the drops of juice as they fall from the leaf-ftalks and

young ſhoots when they are broken off from the tree. In Ceylon the juice is procured by deep inciſions in the bark, and is afterwards inſpiſſated by the heat of the ſun, and moulded into cakes or rolls. Its colour, when pure, is a deep, rather dull orange; its fracture is conchoidal and ſomewhat ſhining. It has no ſmell, and very little taſte, but after remaining for ſome time in the mouth gives a ſlight impreſſion of acrimony. When applied to the flame of a candle it melts and blazes, throwing out ſparks, and emitting a denſe black ſmoke. Gamboge, though not properly ſoluble, is very diffuſible in water, and forms with it an opake yellow-coloured infuſion; and if the liquor be filtered ſome reſin is obtained; but the fluid remains coloured and turbid. With alcohol, which is a more effectual ſolvent than water, gamboge forms a clear gold-coloured fluid; and on the addition of water the alcoholic ſolution becomes turbid like the watery infuſion. Of 16 ounces of gamboge, water, according to Neumann, will take up 13 ounces; and two ounces of the reſidue are ſoluble in alcohol: of an equal quantity alcohol will firſt diſſolve 14 ounces, and one ounce of the reſidue is ſoluble in water: and in both caſes the inſoluble matter amounts to one-ſixteenth of the whole. Both the fixed alkalies and ammonia effect almoſt a total ſolution of gamboge, and produce a clear liquor, of a deep and rich red-brown colour; the reſidue, being pure gum, is entirely ſoluble in water. The addition of an acid to the alkaline ſolution throws down a copious yellow precipitate, which, dried, preſents an earthy fracture, is combuſtible with difficulty, and does not melt like the pure reſin. Aikin's Chem. Dict.

If this ſubſtance be mixed with an equal quantity of ſalt of tartar, it readily diſſolves in common water in a few hours digeſtion; the ſolution, if kept over the fire, ſoon becomes a ſort of ſmooth glue or jelly: and this, by adding a large quantity of water, is readily reduced into a red clear liquor, in a warm digeſtion: this liquor, evaporated over a gentle fire, yields a greyiſh ſalt, which eaſily imbibes moiſture from the air, if not kept in a glaſs well ſtopped; and this extract purges in a ſmaller doſe than the gum itſelf, and yet with leſs irritation; its taſte, however, is extremely acrimonious and fiery, and it muſt therefore be well diſguiſed before it is given. There is, however, another method of giving it, yet more to be recommended than this for general uſe; this preparation is as follows: Tie up the gum in a piece of linen cloth, and put it into a loaf juſt drawn from the oven; the loaf muſt be cut open for this purpoſe, and afterwards tied cloſe together, and ſet in ſome place where it will remain warm four and twenty hours; after this the gum is to be taken out and reduced to powder, and this powder tied up again, and put into another loaf and ſo on to the fourth or fifth time; after which it is to be powdered and kept for uſe. By this eaſy preparation this medicine loſes its violent operation, both as a purgative and emetic, and may be given with great ſafety; and the crumb of the firſt loaf, if eaten, proves purgative. Mem. Acad. Par. 1701.

In ſuch hydropic caſes as require the briſker cathartics, and in other diſorders accompanied with a redundance of ſerous humours, it is an uſeful and ſafe hydragogue; in hot, dry, bilious conſtitutions, it is never to be adminiſtered. In all caſes it is apt, on firſt uſing it, to vomit as well as purge.

The doſe is from two grains to twelve. The emetic power of this medicine is reſtrained by joining it to mercurius dulcis. The compound pills of gamboge are prepared in the following manner: Take of gamboge powdered, extract of ſpike aloe powdered, compound cinnamon powder, of each a drachm; and hard ſoap, two drachms. Mix the powders together; then, having added the ſoap, beat the whole together until they are thoroughly incorporated. The doſe is from five grains to a ſcruple. Pharmac. Lond. 1809.

Solutions of gamboge in alkalized water, and in dulcified alkaline ſpirits, act only by ſtool and urine, and much more mildly than the juice in ſubſtance. The watery tincture is ſtill milder; but the ſpirituous tincture operates with extreme irritation both upwards and downwards. Lewis's Mat. Med.

Gamboge, diſſolved in water, forms a beautiful yellow pigment, and is much uſed as ſuch by painters. Its tincture in alcohol is one of the ingredients of the gold coloured lacquer with which moſt of the modern articles that are made of braſs are overlaid. It is alſo employed by the inlayer and cabinet-maker to ſtain white wood in imitation of box. Dr. Lewis ſays, that it gives a beautiful and durable citron yellow ſtain to marble, whether rubbed in ſubſtance on the hot ſtone, or applied, as dragon's blood ſometimes is, in form of a ſpirituous tincture. When it is applied on cold marble, the ſtone is afterwards heated, to make the colour penetrate. Neumann's Chem. by Lewis, p. 300. note *m*.

GAMBOLD, John, in *Biography*, a pious Engliſh divine, was born at Haverfordweſt in Pembrokeſhire, and at a proper time became a member of Chriſt college, Oxford. In 1734 he took his degree of M.A., and was made chaplain of the college. About the year 1739 he was preſented to a living by Dr. Secker, but previouſly to this he had acted as interpreter to Peter Boehler, a diſciple of count Zinzendorf. This perſon held frequent conferences with the two Weſleys and others of the party, who in 1738 were laying the foundations of methodiſm. Boehler explained his miſſion and doctrines in the Latin language; theſe Gambold interpreted in his diſcourſe to the mixed meetings of learned and unlearned perſons who aſſumed the title of "awakened people." This was the foundation of his own converſion to the Moravian ſyſtem of religion, into which he ſo fully entered, as to abandon his preferment in the eſtabliſhed church, and publicly to join himſelf to the new ſect, which by a public act of the legiſlature was permitted to erect its eſtabliſhments in this country. For many years he was the regular miniſter of the congregation that met in Fetter-lane, London. In 1768 he retired to his native country, where he died, univerſally reſpected, in the year 1771. He was a ſingular, zealous, but innocent enthuſiaſt; but notwithſtanding his avowal of doctrines incompatible with thoſe in which he had been brought up, he reckoned among his friends ſeveral of the Engliſh biſhops who had been his contemporaries at Oxford. Among the Moravians he himſelf had been conſecrated a biſhop at an Engliſh provincial ſynod held at Chelſea. He was a good ſcholar, and was frequently applied to by Mr. Bowyer to aſſiſt in correcting the preſs, in which capacity he ſuperintended, among other valuable publications, the beautiful and accurate edition of Bacon's works in 1765, and in 1767 he was editor, and in part tranſlator, of Crantz's "Hiſtory of Greenland." He was editor of a neat edition of the Greek Teſtament, and publiſhed, as an original author, ſeveral theological pieces; an account of which, with other particulars of his life and labours, may be found in the Anecdotes of Bowyer, by Nichols.

GAMBON, in *Geography*, a river of France, which runs into the Seine, near Andely.

GAMBRON, or Gambroon, or *Bender-Abbas*, a ſea-port town of Perſia, in the province of Lariſtan, ſituated on the Perſian gulf, and formerly belonging to the Perſian monarch. After the death of Nadir-ſhah, a Perſian, named Naſer-

Nafer-Khan, made himfelf mafter of the province, and confequently of the city. He acknowledges himfelf vaffal to Vakeil Kerim Khan of Schiraz, but pays no tribute, and unlefs he is compelled by an army, manifefts no refpect for the Vakeil's authority. This city was famous, in the 17th and beginning of the 18th centuries, as the port of Schiraz, and of the fouth of Perfia, and then its trade was very extenfive. At prefent, fays Niebuhr, it is very low; nor is there a fingle European counting-houfe in the city. This decline has been occafioned by the domeftic difturbances in Perfia, and the wars and difputes between the French and Englifh. The Dutch for a while continued to carry on a petty trade here; but fince they formed a fettlement in the ifle of Karek, they have entirely deferted Gambron. N. lat. 27° 7′. E. long. 56° 44′.

GAMBROVISSA, a town of Iftria; nine miles E. of Capo d'Iftria.

GAMBS, a bailliage and town of Switzerland. This bailliage, which lies S. of Appenzel, and E. of the Rhine, is fubject to the cantons of Schweitz and Glarus; and, together with Gafter and Urnach, comprehends 149 fquare geographical miles, with a population of 9000 perfons. Gambs has a medicinal fulphurous fpring; five miles S. of Appenzel.

GAME, Ludus, a regular diverfion, or a fport prefcribed and limited by rules.

Games may be diftinguifhed into thofe of exercife and addrefs; and thofe of chance or hazard.

To the firft belong tennis, billiards, chefs, bowls, cudgels, wreftling, quoits, fhooting with bows, &c.

To thefe alfo belong the ancient jufts and tournaments.

Under the fecond come cards and dice, &c.

Under cards, again, come feveral fubordinate games; the principal of which are ombre, picquet, baffet, whift, &c.

Games, *Ludi*, in the plural, were fhews, or public reprefentations, ufed among the ancients on religious, funerary, and other folemn occafions.

Such, among the Greeks, were the Olympic, Pythian, Ifthmian, and Nemæan games.

Among the Romans there were three forts of games, *facred*, *honorary*, and *ludicrous*: and Aufonius obferves a difference, fomewhat of the fame kind, among thofe of the Greeks; two of their celebrated games being dedicated to gods, and two to heroes.

Games, *Sacred*, were thofe inftituted immediately in honour of fome deity: of which kind there were the ludi Cereales, Florales, Martiales, Apollinares, Megalenfes, Romani, confuales or Circenfes, Capitolini, Seculares, Plebeii, Compitalitii, Auguftales, Palatini, and Votivi. See each defcribed in its place.

To this clafs may alfo be referred thofe celebrated in memory of fome illuftrious perfon or action; as the ludi Neroniani, and Actiaci, &c.

Authors mention a decree of the Roman fenate, by which it was enacted, that the public games fhould be confecrated, and united with the worfhip of the gods, as a part thereof; and, accordingly, feafts, facrifices, and games, appear to have made up the greateft part, or rather the whole, of the external worfhip or fervice offered to the deities of the Romans.

Games, *Funeral*. See Funeral *games*.

Games, *Honorary*, *ludi honorarii*, were thofe exhibited by private perfons out of their own purfe, in order to gratify the people, or ingratiate themfelves with them, to make way for their own preferment. Such were the combats of gladiators, fcenic games, tragedies, comedies, and other theatrical and amphitheatrical fports.

Games, *Ludicrous*, were of the fame kind with the games of exercife and hazard among us. Such were the ludus Trojanus, or Pyrrhius; the tefferæ, and tali or dice; and the latrunculi, or chefs; the difcus, or quoit; the pila, ball; trocheus, top; nuees, or par impar, odd and even, with nuts; harpaftum, foot-ball; capita vel navem; crofs and pile, &c.

Others diftinguifh the ancient games into three claffes, *viz.* races, combats, and fpectacles. The firft were called equeftrian, or curule games, ludi equeftres, or curules; being races of horfes and chariots, performed in the circus in honour of the Sun and Neptune.

The fecond were called agonales, or gymnici; being combats of men or beafts in the amphitheatre, dedicated to Mars and Minerva.

The laft, called fcenici, poetici, and mufici, were tragedies, comedies, balls, &c. reprefented on the theatres, facred to Venus, Bacchus, Apollo, and Minerva.

Homer gives us a fine defcription of the games which Achilles inftituted at the funeral of his friend Patroclus, in his Iliad; and others of the different games held among the Pheaces, Ithaeans, and at the court of Alcinous, in his Odyffey. And Virgil's defcription of the games celebrated by Æneas, at the funeral of old Anchifes, is not inferior to any of them.

Games, *Secular*. See Secular.

Games, *Mufical*, in the *Greek Antiquity*, games, in almoft all which there were mufical contentions, and honours and prizes conferred on fuperior merit.

At all the four principal public games in Greece, it appears that poetry and mufic had their heroes. Indeed mufical contentions for fuperiority, both vocal and inftrumental, are of fuch high antiquity, as to have preceded the regular eftablifhment of public games. The finging was fometimes alone, and fometimes accompanied by inftruments, and particularly by ftringed inftruments; as poets who compofed verfes for mufic were called lyrics, that is, fuch as accompanied themfelves on the lyre. (See Paufanias Meffenic. cap. 83.) But the inftruments which ufually accompanied the voice, were the cithara, the lyre, the flute, trumpet, and buccina. As all ancient poetry was fung, poets repeating their verfes without inftrumental accompaniments, always did it to vocal melody, not in the indeterminate tones of common fpeech, but in fuch founds as belonged to the Μελος or Μελοποιια. We fhould fuppofe that when any voice, except that of Stentor himfelf, was accompanied by a trumpet or buccina, it muft have been in *ritornels*, or repetitions of portions of the fame melody, as had been previoufly fung, in order to afford the finger time to breathe.

From Plutarch we learn that occafional mufical contefts preceded the regular eftablifhment of any of the public games. (Quæft. Conviv.) The fame author (de Mufica) after enumerating the airs which Terpander had compofed, and to which he had given names, continues to fpeak of his other compofitions, among which he defcribes the proems, or hymns for the cithara, in heroic verfe. Thefe were ufed in after-times, by the rhapfodifts, as prologues, or introductions to the poems of Homer, and other ancient writers. But Terpander rendered his name illuftrious, no lefs by his performance, both upon the flute and cithara, than by his compofitions. This appears by the marbles; by a paffage in Athenæus, from the hiftorian Hellanicus, which informs us that he obtained the firft prize in the mufical contefts at the Carnean games; and by the teftimony of Plutarch, who fays, that "no other proof need be urged of the excellence of Terpander, in the art of playing upon the cithara, than what is given by the regifter of the Pythic games, from which

which it appears that he gained four prizes, ſucceſſively, at thoſe ſolemnities."

After ſpeaking of the victories obtained by this venerable bard, at the public games, it ſeems neceſſary to be ſomewhat minute in deſcribing theſe memorable inſtitutions, as far as they concern muſic. And, in order to convey to the reader as clear an idea as we are able, of the rank which muſic and muſicians held at theſe aſſemblies, we ſhall give ſome account of each of the four principal or ſacred games, ſeparately; and firſt, *of the Olympic games.*

Thucydides tells us that in very remote antiquity there were "games of bodily exerciſe, and of muſic, in which cities exhibited their reſpective choruſes;" and, in teſtimony of this, he quotes the following verſes from Homer's hymn to Apollo:

"To thee, O Phœbus, moſt the Delian iſle
Gives cordial joy, excites the pleaſing ſmile;
When gay Ionians flock around thy fane;
Men, women, children, a reſplendent train,
Whoſe flowing garments ſweep the ſacred pile,
Whoſe grateful concourſe gladdens all the iſle,
Where champions fight, where dancers beat the ground,
Where chearful muſic echoes all around,
Thy feaſt to honour and thy praiſe to ſound."

That there was alſo, continues Thucydides, a muſical game, to which artiſts reſorted to make trials of ſkill, Homer fully ſhews in other verſes to be found in the ſame hymn: for having ſung the Delian chorus of females, he cloſes their praiſe with theſe lines, in which he makes ſome mention of himſelf;

"Hail! great Apollo, radiant god of day!
Hail Cynthia, goddeſs of the lunar ſway!
Henceforth on me propitious ſmile! and you,
Ye blooming beauties of the iſle, adieu!
When future gueſts ſhall reach your happy ſhore,
And refug'd here from toils, lament no more;
When ſocial talk the mind unbending chears,
And this demand ſhall greet your friendly ears—
Who was the bard, e'er landed on your coaſt,
That ſung the ſweeteſt, and that pleaſed you moſt?—
With voice united, all ye blooming fair,
Join in your anſwer, and for me declare;
Say—the blind bard the ſweeteſt notes may boaſt,
He lives at Chios, and he pleaſ'd us moſt."

Smith's Thucydides.

We cannot help pointing out another circumſtance in this hymn, which is really curious, as it implies the cultivation of a talent for imitation, at a time when ſimplicity and original genius ſeem moſt likely to have ſubſiſted, pure and untainted, by ludicrous ſimilitudes.

Homer, in verſe 162, deſcribing the employment of the Delian prieſteſſes, or nuns of the order of Saint Apollo of Delos, tells us, that they were great adepts in the art of mimickry; and that part of the entertainment which they afforded to the numerous people of different nations, who formed their congregation, was, as the poet expreſſes it, from their being ſkilled to imitate the voices and the pulſation, or meaſure, of all nations: and ſo exactly was their ſong adapted, that every man would think he himſelf was ſinging.

Homer ſeems to ſketch out the order of the performance in theſe old Pagan conſervatorios, v. 158: firſt they ſung a hymn in praiſe of Apollo: then another in praiſe of Latona and Diana: then they deſcended to the celebration of human heroes and heroines of ancient times; and it ſeems to have been in this part of their performance that they exerted their mimetic powers, and charmed the nations.

Though Mr. Weſt, in his "Diſſertation on the Olympic Games," publiſhed with ſome of the odes of Pindar, tells us, that theſe aſſemblies were frequented by perſons of the greateſt eminence in all the arts of peace, ſuch as hiſtorians, orators, philoſophers, poets, and painters; who perceiving that the moſt compendious way to fame lay through Olympia, were there induced to exhibit their beſt performances, at the time of the celebration of the Olympic games; yet he has wholly omitted to mention poetical and muſical conteſts, though both can be proved to have had frequent admiſſion there. Indeed theſe were not the principal contentions at Olympia, as they were at Delphos, and in ſome other public games; being ſubordinate to the athletic and gymnaſtic exerciſes, and no part of the pentathlon, or five bodily exerciſes, of leaping, running, throwing the quoit or dart, boxing and wreſtling; though even theſe were accompanied by the flute; for Pauſanias ſays that Pythocritus of Sicyon played ſix times upon the flute during the exerciſe of the pentathlon at Olympia; and in teſtimony of the ſkill and abilities which he manifeſted in his art, a pillar and ſtatue were erected to him with this inſcription:

ΠΥΘΟΚΡΙΤΟΥ
ΚΑΛΛΙΝΙΚΟΥ
ΜΝΑΜΑΤΑ
ΑΥΛΗΤΑ

"To the memory of Pythocritus, victor upon the flute." We have the ſame authority for the horſe-race being accompanied by the trumpet; and many ancient writers tell us that the chariot-race was likewiſe accompanied by the flute.

Pauſanias alſo remarks, that there was a Gymnaſium near Olympia, called Lolichmium, which was open at all times to thoſe who were deſirous of trying their powers in literary combats of every kind, where muſic, as the conſtant companion of poetry, could not have been excluded.

Ælian tells us likewiſe, that, in the 91ſt Olympiad, 416 B. C., Xenocles and Euripides diſputed the prize of dramatic poetry at the Olympic games. Now dramatic poetry was at this time always ſet to muſic, ſung, and accompanied by inſtruments, when performed on the ſtage; it is probable, therefore, that the caſe was the ſame at a public recital; at leaſt with reſpect to the lyric part of the drama.

In the 96th Olympiad, 396 B. C. a prize was inſtituted at the Olympic games for the beſt performer on the trumpet. The firſt performer on this inſtrument, who gained a prize at theſe celebrations, was Timæus of Elis (Αναγραφ, Olym. ad Calc. Chron. Euſeb.). His countryman Crates obtained one there the ſame year, on the cornet, or horn. Archias of Hybla, in Sicily, was victor on the trumpet at three ſeveral Olympiads, after this period. Theſe premiums ſeem not to have been temporary, but to have been continued long after their firſt eſtabliſhment; for Athenæus informs us, that the famous trumpeter, Herodorus of Megara, was victor at the Olympic games ten ſeveral times. Jul. Pollux ſays fifteen. Theſe writers muſt mean that he obtained ſo many prizes at the different games of Greece; as Athenæus informs us, that he was victor in the whole circle of ſacred games, having been crowned at the Olympian, Pythian, Nemean, and Iſthmian, by turns.

Theſe performers on the trumpet appear to have been heralds and public cryers; who not only gave the ſignals at the games for the combatants to engage, and announced their

their ſucceſs, but proclaimed peace and war, and ſounded ſignals of ſacrifice and ſilence, at religious ceremonies.

As Herodorus is allowed to have been cotemporary with Demetrius Poliorcetes, he may be placed about the 120th Olymp. 300 B. C. According to the authors already cited, he was as remarkable for his gigantic figure and enormous appetite, as for the ſtrength of his lungs, which were ſo powerful in blowing the trumpet, that he could not be heard with ſafety, unleſs at a great diſtance. But, upon theſe occaſions, the danger was not always confined to the hearers; the performers themſelves, ſometimes, ſeem to have exulted, and to have been very thankful that they found themſelves alive and well, when their ſolos were ended. An epigram of Archias, the Hyblæan trumpeter, is preſerved in Jul. Pollux, in which he dedicates a ſtatue to Apollo, in gratitude for his having been enabled to proclaim the Olympic games with his trumpet, three times, without burſting his cheeks, or a blood-veſſel, though he ſounded with all his force, and without a capiſtrum, or muzzle.

Even the flute had its dangers, if Lucian may be credited, who relates, with the appearance of great gravity, that Harmonides, a young flute-player, and ſcholar of Timotheus, at his firſt public performance, in order to aſtoniſh his hearers, began his ſolo with ſo violent a blaſt, that he breathed his laſt breath into his flute, and died upon the ſpot.

This account is ſo extraordinary, that it ſeems to require the teſtimony of the author's own words: εναπεπνευσετω αυλω, *breathed his laſt breath into the flute;* and εν τα σκηνη απεθανε, *he died upon the ſtage.*

Plutarch, and ſeveral ancient writers, ſpeak of a kind of paſticcio performance at the public games among the rhapſodiſts, who uſed to collect together favourite paſſages of poetry and muſic of different ſtyles and maſters, and ſing them to the cithara. Cleomenes the rhapſodiſt, however, according to Athenæus, ſung by memory at the Olympic games an entire poem, called the expiations, compoſed by Empedocles. See Rhapsodist.

As a further proof of muſical conteſts forming a part of the Olympic games, we ſhall only obſerve that the emperor Nero, who regarded every great muſician as his rival, diſputed the prize in muſic there, in all its forms: firſt, entering his name with the common candidates, and ſubmitting to all the uſual preparatory diſcipline, as well as to the rigour of the theatrical laws, during performance; and, afterwards, ſupplicating the favour of the nomodictai, or umpires, by all the ſeeming ſubmiſſion and anxiety of a profeſſed muſician; as if an emperor, and ſuch an emperor, had any thing to fear from the ſeverity of his judges.

The victors in every ſpecies of combat were diſtinguiſhed upon all occaſions, and had every where the moſt honourable reception: poets and muſicians of the greateſt eminence were ambitious of celebrating their praiſe; and it is to their triumphs that we owe the odes of Pindar. Other panegyrics of this kind have not come down to us, though every ſucceſsful hero had a bard to record his victory, and to chant his virtues. Both Simonides and Bacchylides compoſed hymns in honour of king Hiero, as well as Pindar; but we ſhall give ſufficient teſtimony hereafter of innumerable compoſitions of the like ſpecies having been produced, and ſung upon ſimilar occaſions, by the greateſt poets and muſicians of antiquity.

The *Pythic games,* Pauſanias informs us, conſiſted, in ancient times, of the poetical and muſical conteſts, and the prize was given to him who had written and ſung the beſt hymn in honour of Apollo. At their firſt celebration, Chryſothemis of Crete, the ſon of Carmanor, who purified Apollo, after he had killed the Python, was victor. After him Philammon, the ſon of Chryſothemis, won the prize; and the next who was crowned, was Thamyris, the ſon of Philammon. Eleutherus is recorded to have gained the prize there by the power and ſweetneſs of his voice; though the hymn which he ſung was the compoſition of another. It is ſaid, likewiſe, that Heſiod was refuſed admiſſion among the candidates, on account of his not having been able to accompany himſelf upon the lyre; and that Homer, though he went to Delphos to conſult the oracle, yet, on account of his blindneſs and infirmities, he made but little uſe of his talent of ſinging and playing upon the lyre at the ſame time.

Hence it appears, that though muſical conteſts were, perhaps, not ranked among the regular and eſtabliſhed exerciſes of the Olympic games, yet all antiquity agrees, that no others were admitted into the Pythic during the firſt ages of their celebration.

It was at the cloſe of the long and bloody war with the ſacrilegious Criſſæans, 591 years B.C. that Eurylochus, the general of the Amphictyons, who from his valour, and the length of the ſiege of Criſſa, was called the New Achilles, inſtituted the ſeveral kinds of Pythic combats at Delphos, which were afterwards conſtantly repeated on the ſecond year of each Olympiad.

Pauſanias, in his enumeration of the muſical conteſts that were added to the ancient Pythic games, at the cloſe of the Criſſæan war, tells us, that the Amphictyons propoſed prizes, not only for thoſe muſicians who ſung beſt to the accompaniment of the cithara, the only combat at the firſt inſtitution of theſe games, but others, both to ſuch as ſhould ſing beſt to the accompaniment of the flute, and to thoſe who, with the greateſt preciſion and taſte, played on that inſtrument alone, without ſinging. Here began the ſeparation of muſic and poetry. All the trials of ſkill, all the performances at banquets, feſtivals, and ſacrifices, had hitherto been confined to vocal muſic, accompanied by inſtruments indeed, but where poetry had an important concern; at leaſt, no inſtrumental muſic, without vocal, ſince the conteſt between Apollo and Marſyas, is mentioned in ancient authors, before this time, except that of the trumpet; the lyre and flute having, in public exhibitions, been mere attendants on the voice, and on poetry.

This was ſoon after the time when Sacadas is recorded to have played his Pythic air on the flute at Delphos, which reconciled Apollo (or his prieſt) to that inſtrument; who, till then, was ſaid to have had it in abhorrence ever ſince the conteſt with Marſyas. This muſician was not crowned the firſt time he played at the Pythic games, but in the two ſubſequent Pythiads he obtained the prize, which furniſhes a proof that inſtrumental muſic, ſeparated from vocal, began now to be ſucceſsfully cultivated among the Greeks.

After this, the ſame games and combats were eſtabliſhed at Delphos as at Olympia. The Amphictyons retrenched the flute accompaniment, on account of that inſtrument being too plaintive, and fit only for lamentations and elegies, to which it was chiefly appropriated. A proof of this, ſays Pauſanias, is given in the offering which Echembrotus made to Hercules of a bronze tripod, with this inſcription:

"Echembrotus, the Arcadian, dedicated this tripod to Hercules, after obtaining the prize at the games of the Amphictyons, where he accompanied the elegies that were ſung in the aſſembly of the Greeks, with the flute."

At the eighth Pythiad, 559 years B. C. a crown was given to players upon ſtringed inſtruments, without ſinging, which was won by Agelaus of Tegea.

The

The prize given to the victors at the Pythic games consisted either of apples, consecrated to Apollo, or, as Pindar informs us, of laurel crowns, which, according to Pausanias, were peculiar to the Pythic games, in allusion to Apollo's passion for Daphne.

Strabo, speaking of the different kinds of contests established by the Amphictyons, at the first Pythic games, after the Crissæans were subdued, mentions a particular species of composition, which was sung to the hymn in praise of Apollo, and accompanied by instruments. It was called the Pythian nome; and was a kind of long cantata, consisting of five parts, or movements, all alluding to the victory obtained by the god over the serpent Python. The first part was called the *Prélude*, or preparation for the fight; the second, *the Onset*, or beginning of the combat; the third, *the Heat of the Battle;* the fourth, *the Song of Victory*, or the insults of Apollo over the serpent Python, composed of iambics and dactyls; and the fifth, *the Hissing of the dying Monster*.

This air, Pausanias tells us, was composed, and first played at Delphos, by Sacadas, who, according to Plutarch, was an excellent poet as well as musician, and author of lyric poems, of elegies, and of a composition consisting of three strophes or couplets, performed successively in the three modes chiefly used in his time, the Dorian, Phrygian, and Lydian; and this air was called trimeles, on account of its changes of modulation. Both Plutarch and Pausanias mention his having been celebrated by Pindar; but as we are not in possession of all that poet's works, this honourable testimony cannot be found at present. The reputation of Sacadas must doubtless have been very great, for Plutarch says, that his name was inserted in the Pythic list of good poets; and Pausanias, that he found his statue, with a flute in his hand, on mount Helicon, and his tomb at Argos.

We are the more minute in speaking of this personage, as he is the first upon record who detached music from poetry, and who, though a good poet himself, engaged the public attention in favour of mere instrumental music; a schism that has been as severely censured as any one in the church. The censurers, however, have forgotten that such schisms, in the arts, are as much to be desired, as those of religion are to be avoided; since it is by such separations only that the different arts, and different branches of the same art, becoming the objects of separate and exclusive cultivation, are brought to their last refinement and perfection.

After Sacadas had pointed out the road to fame, by means of instrumental music, it was so successfully pursued by Pythocritus of Sicyon, whose statue was erected at Olympia, that he gained the prize at Delphos, as a solo player on the flute, six different times.

After their regular celebration was established, a catalogue of more than twenty of the most illustrious poets and musicians of antiquity, who by the encouragement of the Pythic games brought music and poetry to the highest perfection in Greece, has been collected by sir Isaac Newton in his Chronology; these were Archilochus, Eumelus Corinthius, Polymnestus, Thaletas, Xenodemus, Xenocritus, Sacadas, Stesichorus, Tyrtæus, Telesilla, Rhianus, Alcman, Arion, Mimnermus, Alcæus, Sappho, Theognis, Anacreon, Ibycus, Simonides, Æschylus, and Pindar.

At the *Nemean games*, though the exercises were nearly the same as at the Olympic, as we learn from the subjects of the Nemean odes of Pindar; yet that musical performances usually constituted a part of the exercises and amusements at this solemnity, is a fact so fully ascertained by a passage in Plutarch's life of Philopœmen, and corroborated by Pausanias, that we shall give the narration entire, and leave it to speak for itself.

"Philopœmen being elected a second time general of the Achæans, soon after he had gained the celebrated battle of Mantinea, entered the theatre at the Nemean games, while the musicians were disputing the musical prize. At the moment that Philopœmen entered, the musician Pylades, of Megalopolis, happened to be singing to the lyre, the beginning of a song composed by Timotheus, called "the Persians:"

"Behold the hero, from whose glorious deeds
Our greatest blessing, liberty, proceeds!"

The subject of the verse, the energy with which it was uttered, and the beauty of the singer's voice, struck the whole assembly. They instantly cast their eyes on Philopœmen, and, with the most violent applause and acclamation, animated with the hopes of recovering their former dignity, they assumed their ancient spirit and confidence of victory. Pausanias adds, that they unanimously cried out, that nothing could be more applicable than this poem was to the brave general, who had undertaken to command their army."

At the *Isthmian games*, the same trials of skill were exhibited as at the other three sacred games, and particularly those of poetry and music.

Livy relates a very interesting event, which happened during the celebration of these games, after the Romans had defeated Philip king of Macedon, one of the successors of Alexander the Great, who had been in possession of the chief part of Greece.

The time, says this author, for celebrating the Isthmian games was now come. There was always a great concourse of people at them, from the natural curiosity of the Greeks, who delighted in seeing all kinds of combats and bodily exercises, as well as from the convenience of the situation, between two seas, for the inhabitants of different provinces to assemble. But being at this time anxious to know their own fate, and that of their country, all Greece flocked thither, the greater part silently foreboding the worst, and some not scrupling openly to express their fears. At length the Romans took their places at the games, and a herald, with a trumpet, in the usual manner, advanced into the middle of the Arena, as if to pronounce the common form of words; but, when silence was ordered, he proclaimed, "that the Roman senate and people, and T. Quinctius Flamininus their general, after vanquishing Philip and his Macedonians, declared the Corinthians, Phocæans, all the Locrians, the island Eubœa, the Magnesians, Thessalonians, Perrhæbi, Achæans, and Phthiotes, all which states had been possessed by Philip, free, independent, and subject only to their own laws." The joy which this proclamation occasioned in the assembly was, at first, too great to be expressed. The spectators could scarce credit what they heard; they regarded each other with astonishment, as if they had waked out of a dream. Each, diffident of his own ears, with respect to what particularly concerned himself and his own country, asked his neighbour what had been said. The herald was even called again, so strong a desire had they all, not only to hear, but to see the messenger of their liberty, and they had the satisfaction of hearing him repeat the decree. When their joy was fully confirmed, they expressed it in such loud and reiterated shouts of applause, that it was evident liberty was dearer to them than all the other advantages of life. After this the games were celebrated, but with the greatest hurry and confusion; no one had eyes or attention for

for the ſpectacle; every avenue of inferior pleaſure was obſtructed by joy.

Theſe games, in which the victors were only rewarded with garlands of pine-leaves, were celebrated with great magnificence and ſplendor, as long as paganiſm continued to be the eſtabliſhed religion of Greece; nor were they omitted even when Corinth was ſacked and burned by Mummius, the Roman general, at which time the care of them was transferred to the Sicyonians, but was reſtored again to the inhabitants of Corinth, when that city was rebuilt.

Beſides the four games called ſacred, at which poets and muſicians contended for pre-eminence, there were many others of leſs celebrity, the principal of which, however, were the Panathenæan games in honour of Minerva, inſtituted by the Athenians, the moſt elegant, refined, and voluptuous, people of Greece.

There were two ſolemn feſtivals under this denomination at Athens, where prizes were eſtabliſhed for three different kinds of combat: the firſt conſiſted of foot and horſe races; the ſecond, of athletic exerciſes; and the third of poetical and muſical conteſts. Theſe laſt are ſaid to have been inſtituted by Pericles: and that great patron of arts and literature may have been the firſt who excited emulation in poets and muſicians, at this feſtival, by beſtowing rewards upon the moſt excellent; but, according to Plutarch, who had conſulted the Panathenæan regiſter, muſical performances were of much earlier date there than the time of Pericles. Rhapſodiſts were appointed to ſing the verſes of Homer at theſe games, by Hipparchus, the ſon of Piſiſtratus.

Singers of the firſt claſs, accompanied by performers on the flute and cithara, exerciſed their talents here upon ſubjects preſcribed by the directors of theſe exhibitions. And while the Athenian ſtate was free and independent, the noble and generous actions of Harmodius and Ariſtogiton, who had oppoſed the power of the Piſiſtratidæ, and of Ariſtobulus, who had delivered the Athenians from the oppreſſion of the thirty tyrants, impoſed upon them by the Lacedæmonians, were celebrated in theſe ſongs.

Game is alſo uſed for all kinds of wild beaſts and birds fit for eating, and which are ſought after on that account.

Game includes wild beaſts of venery and chaſe; and alſo beaſts and fowls of warren.

Some authors divide game into *large*, which include red and fallow deer: and *ſmall*, to which belong hares, rabbits, pheaſants, and partridges.

A foreſt is a place ſet apart for preſerving, feeding, breeding, &c. all ſorts of game, and conſiſts of divers things, *viz.* ſoil, covert, laws, courts, judges, officers, game, and bounds. See Forest.

A chaſe differs from a foreſt in this, among other things, that it has no variety of game. See Chase.

Ways of catching game are by hunting, hawking, fowling, &c.

There are a great number of laws made for the ſecurity and preſervation of game. The reſtrictive laws relating to foreſts and game were introduced into Europe at the ſame time, and by the ſame people, as gave birth to the feudal ſyſtem: on the irruption of the northern barbarians, it behoved every conquering general, when he ſettled the economy of a vanquiſhed country, and partitioned it among his ſoldiers and feudatories, on condition of military ſervice, to keep the *ruſtici*, or natives of the country, who were not his military tenants, in as low a condition as poſſible, and eſpecially to prohibit them the uſe of arms. In order to this, it became neceſſary to prohibit hunting and ſporting, and that the conqueror ſhould reſerve this right to himſelf, and to ſuch capital feudatories, or barons, on whom he ſhould beſtow it. This excluſive privilege well ſuited the martial genius of thoſe conquering troops, who delighted in a ſport which bore reſemblance to war: and it is remarkable, that in thoſe nations where the feudal policy remains the moſt uncorrupted, the foreſt or game-laws continue in their greateſt rigour. In France all game was properly the king's: and in ſome parts of Germany it is death for a peaſant to be found hunting in the woods of the nobility. In the times of the Britons our whole iſland was repleniſhed with all ſorts of game, which they all enjoyed in common: but when huſbandry took place under the Saxon government, the beaſts fled into deſert tracts, called foreſts, which our royal ſportſmen reſerved for their own diverſion, on pain of a pecuniary forfeiture for ſuch as interfered with their ſovereign. But every freeholder had the full liberty of ſporting upon his own territories, provided that he abſtained from the king's foreſts; as is expreſſed in the laws of Canute and Edward the Confeſſor: "Sit quilibet homo dignus venatione ſua, in ſylva et in agris, ſibi propriis, et in dominio ſuo: et abſtineat omnis homo a venariis regiis, ubicunque pacem eis habere voluerit:" which indeed was the ancient law of the Scandinavian continent, from whence Canute probably derived it: "Cuique enim in proprio fundo quamlibet feram quoquo modo venari permiſſum." However, upon the Norman Conqueſt, a right of purſuing and taking all beaſts of chaſe, and other animals called game, was held to belong to the king, and to ſuch only as were authorized by him. This doctrine was founded, not only upon the principles of the feudal law, that the king is the ultimate proprietor of all the lands in the kingdom, being held of him as the chief lord, or lord paramount of the fee, and that he has therefore the right of the univerſal ſoil, to enter thereon and to take and chaſe ſuch creatures at his pleaſure; but alſo upon another maxim of the common law, that theſe animals are "bona vacantia," and, having no other owner, belong to the king by his prerogative. As the former reaſon was held to veſt in the king a *right* to purſue and take them any where; the latter was ſuppoſed to give the king, and ſuch as he ſhould authorize, a *ſole* and *excluſive* right. This right was exerted at and after the time of the Norman eſtabliſhment, with the utmoſt rigour. Blackſt. Com. vol. ii. p. 431, &c. See Forest.

From this principle, that the ſole right of taking and deſtroying game belongs excluſively to the king, if it be admitted, it will follow, that no perſon, who does not derive his right from the crown, is by common law entitled to take or kill any beaſts of chaſe, or other game whatſoever. The principle now ſtated, "that the ſole property of all game is veſted in the king alone," has been rendered queſtionable by Mr. Chriſtian in his learned comment on Blackſtone's Commentary. Mr. Daniel, in his "Rural Sports," has alſo introduced ſeveral obſervations on the game laws, which tend to invalidate the general reaſoning of the learned judge upon this ſubject. The reaſons recited by Blackſtone for eſtabliſhing theſe conſtitutions are as follow: 1. "For the encouragement of agriculture and improvement of lands, by giving every man an excluſive dominion over his own ſoil;" but Mr. D. objects that it cannot eaſily be comprehended how, upon the author's principle, the reſtriction of a natural right to kill animals denominated game on his own grounds, or permiſſively on thoſe of another, and how the forbidding of a freeholder of leſs than 100*l.* a year, to kill a partridge upon his own eſtate, gives every man an excluſive dominion over his own ſoil. It is certainly not ſo obviouſly beneficial in this way as to promote the encouragement of agriculture, and the improvement of lands. Another reaſon is, 2. "For preſervation of

of the feveral fpecies of thefe animals, which would foon be extirpated by a general liberty." And again, 3. "For the prevention of idlenefs and diffipation, in hufbandmen, artificers, and others of lower rank, which would be the unavoidable confequence of univerfal licence." Thefe reafons, it is alledged, deftroy each other. It is plain, that without any reftrictive laws, the evil would have cured itfelf; for if game would be extirpated by a general licence, it would follow of courfe that all idlenefs and diffipation arifing from this caufe muft end with the caufe itfelf, and would require no law for its prevention. Another reafon affigned in favour of the foreft and game laws is, 4. "The prevention of popular infurrections and refiftance to government, by difarming the bulk of the people." But that the makers of thefe laws were actuated by this motive, is an opinion which the hiftory and manners of the times will hardly allow us to admit. Hawks were at this time chiefly ufed to kill birds; and military weapons do not feem to have been much ufed in the purfuit of game. Befides, the firft qualifying ftatute, 13 Ric. II. does not mention any inftrument likely to be very ferviceable in the hands of fedition; nor was the government in thofe days fo extremely tender of the liberties of the people, as to take this indirect method of difarming them, and of relieving itfelf from the apprehenfions of revolt. The habits, whatever they were, acquired in the purfuit of game, could not much contribute to initiate the peafantry in the rudiments of military fcience. Our author farther examines fome of the principal early ftatutes relating to game, and hence he infers that the right to purfue and deftroy it, was at no time, by the conftitutional law of this kingdom, held to be *folely* and *exclufively* in the fovereign. It was clearly a *general* right, and did fubfift as fuch in *fact* and *ufage*, until upon principles of public expediency, it was judged fit to regulate and limit the enjoyment of it. Previoufly to the enactment of any reftrictive ftatutes refpecting it, it ftood upon the bafis of the common law. Game belongs to the clafs of "feræ naturæ," and of thefe the learned commentator has himfelf affirmed, "that by the law of nature, every man, from the prince to the peafant, has an *equal right* of purfuing and taking them to his own ufe." Now as every natural right is protected and confirmed by the common law, and forms a part of it, to allow that this is a *natural* and *common right*, and at the fame time to affirm "that no perfon whatever, but he who has a *derivative right*, is, by the common law, entitled to take or kill any beaft of chafe or other game whatever," is utterly repugnant and contradictory. If to kill game be a *natural right* (as it is declared to be), and *equally common* to all the king's fubjects, it follows that it cannot be the *fole* and *exclufive prerogative* of the king. If, on the other hand, it is the *fole* and *exclufive prerogative* of the crown, then it cannot be in its origin a *natural* and *common right*. Lord Coke fays (1 Inft. 142.) "the common law is fometimes called right, *common right*, and common juftice. Thus, *common law* and *common right* are convertible terms; and fir William Blackftone's pofitions controvert each other. The learned judge has alfo been charged with advancing a doctrine wholly unprecedented, and inconfiftent with the ftatute (22 and 23 Car. II. c. 25) when he afferts, that "the circumftance of having 100*l. per annum*, and the reft, are not properly *qualifications*, but *exemptions*." If the king has the *fole* and *exclufive* prerogative to take and kill game, this prerogative is alike infringed by perfons deftroying game, whatever be their condition or degree, and *he alone* muft be the perfon injured by fuch an unauthorized act; but in the above cited ftatute we find the ftealing, taking, and killing of game, by diforderly perfons, declared to be not to the injury of *the king*, as invading his peculiar privilege, but to the prejudice of *noblemen*, *gentlemen*, and *lords* of *manors*, and *others*, *owners of warrens*. But what prejudice could arife to noblemen and gentlemen, if fuch perfons had not any *right* to take or kill game? If they themfelves could not lawfully enjoy it, but ftood merely in the condition of perfons *exempted* from *additional* penalties inflicted on fuch diforderly perfons as are the immediate objects of the act, how, with any fort of truth or propriety, could it be affirmed of them, that they were the perfons whofe property or whofe privileges were violated or infringed? If we are to confult the motives of the legiflature and the policy of the ftatute, thofe motives and that policy unqueftionably were, to preferve the game to the perfons defcribed in the preamble of the ftatute, and to fuperadd fuch limitations to the general right to kill game as are therein particularly ftated. It has been farther alleged, that there is a fallacy in one of the principal arguments which the learned commentator has adopted for enforcing his doctrine with refpect to the game-laws. That the fole right of taking and deftroying game belongs exclufively to the king, appears, we are told, from this; that "he may grant to his fubjects an exclufive right of taking them, which he could not do unlefs fuch a right was firft inherent in himfelf. But here the learned writer omits to diftinguifh between "the *grant of an original right*," and "the qualifying by certain reftrictions a right *previoufly poffeffed*."

No admirer, it is faid, of a manly, liberal, well-regulated fyftem, of public freedom, will be forward to affert, that the laws for the prefervation of game do not require to be very thoroughly revifed. They certainly depart more widely from the line of genuine political juftice, and expofe the humble unqualified claffes of the community more to the hazard of punifhment and the oppreffion of power, than any rational advocate of *moral* equality can confiftently approve. Their penalties are alfo infinitely too fevere. That the punifhment of death fhould in any cafe be inflicted on an act which in itfelf violates no rule of religion, juftice, or morality, is a reflection from which the mind revolts with pain and horror. Where is the wrong to individuals that demands fuch an atonement? Where is the injury to fociety which requires fuch an example? That the act of deftroying game is not *malum in fe* is evident; for if it were, the legiflature could not licenfe it. Not only the want of true wifdom, but the want of common juftice in thefe ftatutes, requires the moft earneft and attentive confideration in thofe who adminifter in the government of the ftate. "When the legiflature fhall turn its attention to the revifion of our penal ftatutes, thofe which refpect the prefervation of game will without doubt receive that fhare of correction which they fo much need. At prefent the civil penalties which they impofe are inordinately fevere and oppreffive. That they fhould originally have crept into our code, as they did, at a period when the rights of the fubject, being neither greatly regarded nor well underftood, were without much ceremony fettered with reftrictions, is not furprifing; but that they fhould be fuffered to reproach our ftatute-book in an age when freedom, refined by fcience, boafts the enlargement of her empire; when the political and moral rights of all orders of men are fubmitted to the teft of reafon and the touchftone of philofophy, and a "patriot fovereign" fanctions thofe rights by his fupport, and protects them by his power; that at fuch a period the fpirit of hardfhip and injuftice fhould difplay itfelf fo confpicuoufly in this part of our penal fyftem, reflects a difhonour on our conftitution, from which its confiderate admirers muft moft ardently wifh it relieved."

In

In the prefent ftate of the game laws, perfons exempted from the penalties which they inflict for killing game, are not only liable to actions of trefpafs by the owners of the land, but alfo, if they kill game within the limits of any royal franchife, they are liable to the actions of fuch who may have the right of chafe or free warren therein. Upon the whole it appears, that the king, by his prerogative, and fuch perfons as have, under his authority, the royal franchifes of chafe, park, free warren, or free fifhery, are the only perfons who may acquire any property, however fugitive and tranfitory, in thefe animals, *feræ naturæ*, while living; which is faid to be vefted in them, *propter privilegium*. Moreover, fuch perfons as may thus lawfully hunt, fifh, or fowl, *ratione privilegii*, have only a qualified property in thefe animals; it not being abfolute or permanent, but lafting only fo long as the creatures remain within the limits of fuch refpective franchife or liberty, and ceafing the inftant they voluntarily pafs out of it. Although no man can come upon another man's ground to kill game, without being liable to an action of trefpafs; and though the common law allows of the hunting of foxes and badgers, being beafts of prey, in another man's ground, becaufe the deftroying of them is looked upon as a public benefit; yet in this cafe the digging and breaking of the ground to unearth them is held to be unlawful, and the owner of the ground may maintain an action of trefpafs. It is held, however, that if a man ftarts any game within his own grounds, and follows it into another's, and kills it there, the property remains in himfelf; and this is grounded on reafon and natural juftice; for the property confifts in the poffeffion, which poffeffion commences by the finding it in his own liberty, and is continued by the immediate purfuit. (11 Mod. 75. Puff. Q. N. l. 4. c. 6.) Thus, alfo, if a ftranger ftarts game in one man's chafe or free warren, and hunts it into another's liberty, the property continues in the owner of the chafe or warren; this property arifing from privilege, and not being changed by the act of a mere ftranger. (L. Raym. 251.) Or, if a man ftarts game on another's private grounds, and kills it there, the property belongs to him in whofe ground it was killed, becaufe it was alfo ftarted there; this property arifing *ratione foli*. (L. Raym. ibid.) Whereas if, after being ftarted there, it is killed in the grounds of a third perfon, the property belongs not to the owner of the firft ground, becaufe the property is local; nor yet to the owner of the fecond, becaufe it was not ftarted in his foil; but it refts in the perfons who ftarted and killed it, though guilty of a trefpafs againft both the owners. (Farr. 18. L. Raym. ibid.)

As the ancient laws relating to game are ftill in force, it is deemed neceffary to ftate, as concifely as poffible, the provifions contained in them.

The firft qualification relating to game was eftablifhed by 13 Ric. II. ftat. 1. cap. 13. which enacted that no layman, who hath not lands or tenements of 40*s*. a year, nor clergyman without preferment of 10*l*. a year, fhall keep any greyhound or other dog for hunting, nor ufe ferrets, nets, and other engines for deftroying game, on pain of a year's imprifonment. See alfo 16 Geo. III. c. 30.

By a ftatute in 33 Hen. VIII. cap. 6. it is enacted, that no perfon fhoot with, nor keep in his houfe, any crofs-bow or ftone-bow, hand-gun or hagbut, under the length of one yard, unlefs he have lands, tenements, annuities, or offices, of the yearly value of 100*l*. on pain of a forfeiture of 10*l*. for every offence: nor fhall any perfon travel with a crofs-bow bent, or gun charged, or fhoot within a quarter of a mile of a city or town, except at a dead mark, or in defence of his houfe, under the like forfeiture, to be divided between the king and the profecutor. This act continues ftill in force, though the object of it, which was the encouragement of the ufe of the long-bow, doth not now exift.

None under the degree of a baron fhall fhoot with any hand-gun, within a city or town, or fhoot at any fowl whatever with hail-fhot on the fame forfeiture. (2 and 3 Edw. VI. c. 14.) This act was repealed by 6 and 7 Will c. 13.

Any perfon fhooting in the night-time, or difguife, fhall be deemed a felon, if he deny; if he confefs, he is fineable at the next general feffions. (1 Hen. VII. cap. 7.) This ftatute is fuperfeded by the *Black Act*, 9 Geo. cap. 22. No perfon fhall take any partridge or pheafant by nets, &c. on the freehold of another perfon, without leave of the owner, under the penalty of 10*l*., half to him that fues, and half to the owner of the ground. 11 Hen. VII. cap. 17.

No perfon fhall keep any net, called deer-hays or buckftalls, on pain of 10*l*. a month. (19 Hen. VII. cap. 11.) None fhall break into an impaled park or inclofed ground and chafe out and kill any deer, under the penalty of 10*l* to the party aggrieved, or treble damages and cofts, and finding fureties for feven years. 5 Eliz. cap 21. explained and amended by 3 Jac. cap. 13. and 7 Jac. cap. 13. If any perfon, of what eftate or condition foever, fhall take, kill, or deftroy any pheafants or partridges in the night-time, and be convicted thereof at the affizes, feffions, or leet, he fhall forfeit for every pheafant 20*s*. and for every partridge 10*s*. half to him that fhall fue, and half to the lord of the manor. (23 Eliz. cap. 10). None fhall kill or take pheafants or partridges, with any net or engine, in the night-time, on forfeiture of 20*s*. for every pheafant, and 10*s*. for every partridge, 33 Eliz. None fhall hunt or hawk with fpaniels in ftanding corn, or before it be fhocked, unlefs on his own ground, on the penalty of 40*s*. half to the king, and the other half to the proprietor of the ground.

He that is convicted of killing or taking a pheafant, partridge, duck, heron, hare, or other game; or of taking and deftroying the eggs of fwans, pheafants, or partridges; fhall pay 20*s*. for every fuch fowl, hare, &c. to the ufe of the poor. 1 Jac. I. cap. 27. This act, as far as it relates to hares, is repealed by 48 Geo III. cap. 93.

Every perfon convicted to have kept a greyhound, dog, or net, to kill or take deer, hare, pheafant, or partridge, unlefs he have inheritance in his own right, or the right of his wife, of 10*l*. per annum, a leafe for life of 30*l*. per annum, or be worth 200*l*. in goods, or be the fon of a knight or lord, or the fon and heir apparent of an efquire, and be convicted thereof by confeffion, on oath of two witneffes before two juftices, fhall be committed to gaol for three months, unlefs he pay 20*s*. for the ufe aforefaid, or after one month after his commitment become bound with two fureties not to offend in like manner. This was the fecond qualification by eftate or degree for killing game. Nor fhall any fell, or buy to fell again, any deer, hare, pheafant or partridge, on pain of 40*s*. for every deer, 10*s*. for every hare, and 20*s*. for every pheafant or partridge, half to him that will fue, and half to the poor. Id. ftat. cap 27.

The next qualification relates to deer and conies only: this forbids a perfon not having hereditaments of 40*l*. a year, or goods of 200*l*. value, from ufing any gun or bow to kill deer or conies, or from keeping nets or coney dogs, except he hath inclofed grounds, ufed for the keeping of deer or conies, in which the increafe of the conies amounts to 40*s* a year, or be a keeper or warrener, under the penalty of having his guns, nets, &c. liable to be taken away by any perfon having lands or hereditaments of 100*l*. a year in fee or for life. 3 Jac. I. cap. 13.

The lord of a manor, or one having inheritance of 40*l*. per annum, lives-eftate of 80*l*. or goods worth 400*l* or their fervants licenfed by them, may take pheafants or partridges

tridges within their own lands or precincts, in the day-time, between Michaelmas and Chriſtmas. 7 Jac. I. cap. 11.

Hawking of pheaſants and partridges betwixt the firſt of July and the laſt of Auguſt is prohibited, under the penalty of 40*s*. for every ſuch hawking, and 20*s*. for every pheaſant or partridge deſtroyed. 7 Jac. cap. 11.

They that kill or take away any red or fallow deer, without conſent of the owner, ſhall forfeit 20*l*. to be taken by diſtreſs: one half to the owner, and the other to the informer; or, for want of ſuch diſtreſs, ſhall ſuffer a year's impriſonment. 13 Car. II.

Lords of manors, or other royalties, not under the degree of eſquire, may commiſſion one or more game-keepers who may ſeize all guns, dogs, bows, &c. of perſons not having eſtates, in their own or wife's right of 100*l*. per annum freehold, or for term of life; or 150*l*. per annum leaſehold, for ninety-nine years or upwards; or not being ſons and heirs of eſquires, or other perſons of higher degree; or owners or keepers of a foreſt, park, chaſe, or warren; and deſtroy, or convert ſuch guns, &c. to the uſe of the lord, 22 and 23 Car. II. cap. 25. For this purpoſe it has been judged neceſſary to have a warrant from a juſtice of peace, after information and oath of the offence firſt made. This is the laſt general qualification for killing game, and that which is now moſt to be regarded.

If any enter a coney-warren, uſed and kept for the breeding or keeping of conies, though not incloſed, and chaſe or kill conies, he ſhall forfeit treble damages, and be impriſoned three months: and they that kill conies in the night time upon the borders of warrens, or grounds uſed for keeping conies, ſhall be amerced at the diſcretion of the juſtice of peace, and pay down for the uſe of the poor any ſum not exceeding 10*s*. Id. ſtat.

By 16 G. III. c. 30. (which repeals in whole or in part 9 former acts relating to the ſubject of deer-ſtealing); and by 42 G. III. c. 107. (which repeals the firſt act of the 16 G. III.) it is enacted as follows: If any perſon ſhall courſe or hunt, or ſhall take in any ſlip, nooſe, toyle, or ſnare, or ſhall kill, wound, or deſtroy, or ſhall ſhoot at, or otherwiſe attempt to kill, wound, or deſtroy, or ſhall carry away any red or fallow deer, in the incloſed part of any foreſt, chaſe, purlieu, or ancient walk, or in any incloſed park, paddock, wood, or other incloſed ground, where deer are, have been, or ſhall be uſually kept, without the conſent of the owner, or without being otherwiſe duly authorized; or ſhall be aiding, abetting, or aſſiſting, every perſon ſo offending ſhall be guilty of felony, and adjudged to be tranſported for ſeven years. And every perſon who ſhall commit any of the ſaid offences in the uninclosed part of any ſuch foreſt or other ground, or ſhall be abetting, ſhall for every ſuch offence forfeit 50*l*.: and if the offender ſhall be a keeper of, or intruſted with the cuſtody or care of ſuch deer, he ſhall forfeit double. The proviſions of the 16 G. III. c. 30. reſpecting the ſeizing and conviction of offenders, and the recovery and application of penalties, and the appeal, &c. are extended to the 42 G III. c. 107. See Deer-*Stealers*.

In caſe any hare, partridge, pheaſant, fiſh, fowl, or other game ſhall be found in any offender's houſe, he ſhall forfeit a ſum not leſs than 5*s*. nor more than 20*s*. to be levied by diſtreſs, half to the informer, and half to the poor; or, in want thereof, he ſhall be committed to the houſe of correction for a ſpace of time not greater than a month, nor leſs than ten days. And if any perſon, not qualified by law, ſhall keep or uſe any bows, greyhounds, ſetting dogs, ferrets, tumblers, ſnares, &c. he ſhall be ſubject to the ſame penalties. 4 and 5 Will. cap. 23.

If any higler, chapman, carrier, inn-keeper, or victualler, ſhall have in his keeping any hare, pheaſant, partridge, heath game, or growſe, not put in his hands by a perſon qualified by law, he ſhall forfeit 5*l*. for every ſuch hare, &c. half to the informer, and half to the poor, to be levied by diſtreſs; or, for want thereof, he ſhall be ſent to the houſe of correction for three months for the firſt offence, and for every other offence four months. 5 Anne, cap. 14.

If any perſon, whether he be qualified or not, ſhall ſell, or expoſe to ſale any hare, pheaſant, partridge, moor, heath game, or growſe, he ſhall be liable to the ſame penalty. 28 Geo. II. cap. 12.

Perſons not qualified, keeping greyhounds, lurchers, ſetting-dog, or engines to deſtroy game; and game-keepers, who, under colour of office, kill and ſell game without their maſter's knowledge; are liable to the like penalty. 5 Anne, cap. 14.

No lord of the manor is to appoint more than one game-keeper, and his name to be entered with the clerk of the peace, who is to give a certificate thereof; otherwiſe he is liable to the penalties againſt higlers. And if any other game-keeper, whoſe name is not ſo entered, who ſhall not be otherwiſe qualified by the laws of this kingdom to kill game, ſhall kill, ſell, or expoſe to ſale any hare, pheaſant, partridge, moor, heath-game, or growſe, he ſhall, on conviction before one juſtice, and on the oath of one witneſs, be liable to the ſame penalty for the firſt offence, and for every other offence to be ſent to the houſe of correction for four months. 5 and 9 Anne, cap. 25.

If any hare, pheaſant, &c. be found in the poſſeſſion of a perſon not qualified, unleſs he be entitled to it by ſome perſon that is qualified, the ſame ſhall be adjudged an expoſing it to ſale. Perſons deſtroying a hare in the night ſhall incur the forfeiture of 5*l*. 9 Anne, c. 25. 28 G. II. c. 12.

Any juſtice of the peace, and lord within his manor, may take away ſuch hare, &c. found in the cuſtody of a perſon not qualified; and any perſon that ſhall deſtroy, ſell, or buy any hare, &c. and ſhall in three months diſcover any higler, carrier, victualler, &c. that hath bought or ſold, or offered to buy or ſell, or had in their poſſeſſion any hare, &c. ſhall be diſcharged of the penalty annexed to his own offence, and receive the ſame benefit as any other informer. 5 Anne, cap. 14.

No lord of a manor ſhall appoint a game-keeper with power to kill or deſtroy game, unleſs he be qualified by the laws of the realm, be truly a ſervant of ſuch lord, or be immediately employed to kill game for the ſole uſe of ſuch lord; nor ſhall any lord authorize a perſon not qualified to keep or uſe gun, greyhounds, &c. and ſuch perſon as ſhall be found offending in either of theſe points, ſhall, for every offence, forfeit 5*l*. (3 Geo. I. cap. 11. repealed by 48 Geo. III. cap. 93.) If any perſon enter a park, paddock, or other incloſed ground where deer are uſually kept, and wilfully wound or kill any red or fallow deer, he ſhall be tranſported to the plantations for ſeven years. 5 Geo. I. See Black *Act*. See alſo Deer-*Stealers*.

If any perſon ſhall by hays, tunnels, or other nets, drive and take any wild duck, teal, widgeon, or any other water-fowl, in any place of reſort for wild fowl in the moulting ſeaſon between June 1 and Oct. 1, yearly, he ſhall, on conviction, forfeit for every ſuch fowl 5*s*. half to the informer, and half to the poor, by diſtreſs, or be committed to the houſe of correction for a time not exceeding one month, nor leſs than fourteen days: and the nets ſhall be ſeized and deſtroyed in the preſence of the juſtice. (9 Anne, cap. 25. 10 Geo. II. cap. 32.) And perſons deſtroying the eggs of any duck, teal, or other water-fowl, from March 31 to June 30, ſhall be liable to a year's impriſonment, or forfeiture of one penny for every egg. 25 Hen. VIII. cap. 11.

No perſon ſhall, on any pretence whatſoever, take, kill, carry, ſell, buy, or have in his poſſeſſion or uſe, any partridge,

 between

between Feb. 1 and Sept. 1 (39 G. III. c. 34.); or any pheaſant, between Feb. 1 and Oct. 1. yearly; on pain of forfeiting, on conviction by one witneſs in any of the courts of record at Weſtminſter, 5*l.* for every ſuch fowl, with full coſts. 2 Geo. III. cap. 19.

And if any perſon ſhall ſhoot at, kill, or take any dove-houſe, or pigeon, and be convicted by confeſſion, or oath of one witneſs, before one juſtice, where the offence was committed, or the party apprehended, he ſhall forfeit 20*s.* to the proſecutor, or be committed to gaol or the houſe of correction for a time not exceeding three calendar months, nor leſs than one. Id. ſtat.

If any perſon ſhall knowingly or wilfully kill, take, or deſtroy, or uſe any gun, dog, ſnare, net, or other engine, with intent to kill, take, or deſtroy any hare, pheaſant, partridge, moor game, or heath game, in the night between the hours of ſeven at night and ſix in the morning, from the 12th day of October to the 12th day of February; and between the hours of nine at night and four in the morning, from the 12th day of February to the 12th day of October; or in the day-time, upon a Sunday or Chriſtmas-day; he ſhall, on conviction by oath of one witneſs, before one juſtice, forfeit for the firſt offence a ſum not exceeding 20*l.* nor leſs than 10*l.*; for the ſecond offence not more than 30*l.* nor leſs than 20*l.*; and for the third and every ſubſequent offence 50*l.*; each penalty to be levied by diſtreſs, and to be paid half to the informer, and half to the poor. In caſe of refuſal of payment of the fine of 50*l.* the offender ſhall be committed to the houſe of correction for no leſs than ſix, nor more than twelve calendar months, unleſs ſuch penalty ſhould be ſooner paid; and the offender may be once publicly whipped, if the juſtices think proper. (13 Geo. III. cap. 80.) And, moreover, by 39 and 40 G. III. c. 50. idle and diſorderly perſons, to the number of two or more, who ſhall deſtroy any pheaſant or partridge in the night; or who ſhall be found in any paddock, foreſt, chaſe, &c. between 8 at night and 6 in the morning, from Oct. 1 to Feb. 1, or between 10 at night and 4 in the morning from Feb. 1 to Oct. 1, having any inſtrument for the purpoſe, and with the intent of taking or deſtroying any hare, black or red game, or any of their abettors, &c. ſhall be deemed rogues and vagabonds within the meaning of 17 Geo. II. c. 5.

No perſon ſhall take, deſtroy, carry, ſell, buy, or have in his poſſeſſion any heath fowl, called black game, between Dec. 10 and Aug. 20; nor any growſe, commonly called red game, between Dec. 10 and Aug. 12; nor any buſtard, between March 1 and Sept. 1, in any year, on pain of forfeiting for the firſt offence any ſum not exceeding 20*l.* nor leſs than 10*l.* and for the ſecond, and every ſubſequent offence, not exceeding 30*l.* nor leſs than 20*l.* half to the informer, and half to the poor. (13 Geo. III. cap. 55.) And perſons taking or killing in the New Foreſt any black game between Dec. 10 and Sept. 1, ſhall be liable to the ſame forfeiture. (43 Geo. III. c. 112.) See FISHING, HAWKING, HERONS, SWANS, &c.

By 25 Geo. III. c. 50. every perſon who ſhall uſe any dog, gun, net, or other engine for the taking or deſtruction of game (not acting as a game-keeper) ſhall previouſly deliver in a paper or account in writing, containing his name and place of abode, to the clerk of the peace of the county where he ſhall reſide, and annually take out a certificate thereof, upon which ſhall be charged a ſtamp-duty of 2*l.* 2*s.*: and by 31 Geo. III. cap. 21. 1*l.* 1*s.* more—total 3*l.* 3*s.* Such certificate, iſſued by the clerk of the peace, and bearing date on the day of its being iſſued, ſhall continue in force until the 1ſt day of July next following its date, for which the clerk of the peace ſhall receive 1*s.* for his trouble. And if he ſhall iſſue any certificate otherwiſe than as above ſet forth, or neglect or refuſe to deliver it, he ſhall forfeit 20*l.*, and moreover be liable to pay the duty on ſuch certificate. And if any perſon ſhall uſe any greyhound, hound, pointer, &c. or any gun, net, or other engine, for the taking or deſtruction of any hare, pheaſant, partridge, black or red game, or any other game whatſoever, without having obtained ſuch certificate, he ſhall forfeit 20*l.* A perſon who has obtained a certificate may demand from a perſon uſing any dog, gun, net, or other engine, for the taking or deſtruction of game, an inſpection of his certificate; and if ſuch perſon refuſe to produce it, or to give in his chriſtian and ſurname, and the place of his reſidence, or give in a fictitious name or place of reſidence, he ſhall forfeit 50*l.* But ſuch certificate ſhall not authorize killing game at unlawful times, nor by unqualified perſons. Liſts of ſuch certificates ſhall on or before the 1ſt day of Auguſt in each year be tranſmitted by the clerks of the peace to the head-office of ſtamps; and in every caſe of failure or error they ſhall forfeit 20*l.* Such liſt ſhall be kept at the ſaid office for inſpection; and the commiſſioners ſhall cauſe the ſame to be inſerted in the news-papers circulating in each reſpective county, or in ſuch public news-paper as to them ſhall ſeem moſt proper. Appeals may be made to the next ſeſſions. By 48 Geo. III. c. 55. on every perſon, who ſhall uſe any dog, gun, net, or other engine, for the purpoſe of taking or killing any game whatever, or any woodcock, ſnipe, quail, or landrail, or any conies, if ſuch perſon be a ſervant to any perſon thereby charged in reſpect of ſuch ſervant to the duties granted on ſervants by this act, ſhall be charged the annual ſum of 1*l.* 1*s.*; and if ſuch perſon be not a ſervant, 3*l.* 3*s.*; and upon every other perſon ſhall be charged the annual ſum of 3*l.* 3*s.*

GAME, *Black*. See GROUSE.

GAME-*cock*. See COCK.

GAME, *Red*. See GOR-*cock*.

GAME, *White*. See PTARMIGAN.

GAME-*keeper*, is one who has the care of keeping and preſerving the game, being appointed thereto by the lord of a manor. See GAME.

By 25 Geo. III. cap. 5. every deputation of a game-keeper ſhall be regiſtered with the clerk of the peace of the county where the manor ſhall lie, and ſuch game-keeper ſhall take out a certificate thereof annually, upon which ſhall be charged a ſtamp-duty of 10*s.* 6*d.*: and by 31 Geo. III. cap. 21. 10*s.* 6*d.* more—total 1*l.* 1*s.* By 48 Geo. III. cap. 149. the annual duty for the deputation of a game-keeper is 1*l.* 10*s.* A game-keeper, who, having obtained a deputation, ſhall for 20 days afterwards refuſe or neglect to regiſter the ſame, and take out a certificate, ſhall forfeit 20*l.* But no ſuch deputation and certificate ſhall authorize any ſuch game-keeper to take or deſtroy game out of the limits of the manor for which ſuch deputation was given. Such game-keeper muſt be a ſervant of the lord of the manor who appoints him, or be immediately employed for him. A perſon not thus qualified is liable to a forfeiture of 5*l.* if under colour of a deputation, &c. he take and kill any hare, pheaſant, partridge, or other game, or keep or uſe any greyhound, &c. ſetting dogs, hays, lurchers, guns or any other engine to kill the game.

GAMELIA, Γαμηλια, a nuptial feaſt, or rather ſacrifice, held in the ancient Greek families on the day before a marriage. It was thus called from γαμος, *marriage*; whence alſo Γαμηλιος, an epithet, or ſurname, given to Jupiter and Juno, conſidered as preſiding over marriages.

GAMELION, Γαμηλιων, in *Ancient Chronology*, the eighth month of the Athenian year. It contained twenty-nine days,

and anfwered to the latter part of our January, and the beginning of February.

This month had its name from being facred to Jupiter and Juno, diftinguifhed by the epithet Γαμηλιος, becaufe they prefided over marriages.

GAMELION, or *Gamelium*, a poem, or compofition in verfe, on the fubject of a marriage; more ufually called an epithalamium.

GAMELORA, in *Geography*, a fmall ifland in the Mediterranean, near the N.E. coaft of Tunis; 3 miles E. of cape Zibeeb.

GAMELSBACH, a town of Germany, in the county of Erbach; 7 miles E. of Erbach.

GAMESFIELD, a town of Franconia; 5 miles S.W. of Rothenburg.

GAMET, or *Old Mendoe*, a fmall ifland in the North fea, belonging to Denmark, 3 miles from the continent. N. lat. 55° 20'. E. long. 8° 30'.

GAMETRIA. See GEMATRIA.

GAMGO, in *Geography*, a river of Africa, which runs into the Coanza, 15 miles S. E. of Meopongo.

GAMING, the art or act of performing or practifing a game, particularly a game of hazard.

All public gaming is feverely prohibited; and what money is thus loft, is recoverable again by law.

In China, gaming is equally prohibited among the common people and the mandarins; and yet this does not hinder their playing and frequently lofing all they have; their lands, houfes, children, and even wives, which are all fometimes laid on a fingle card. F. le Compte.

In gaming, as judge Blackftone very pointedly obferves, the feveral parties engaged caft lots to determine upon whom the ruin fhall at prefent fall, that the reft may be faved a little longer. Taken in any light, this is an offence of the moft alarming nature; tending by neceffary confequence to promote public idlenefs, theft, and debauchery among thofe of a lower clafs; and, among perfons of a fuperior rank, it hath frequently been attended with the fudden ruin and defolation of ancient and opulent families, an abandoned proftitution of every principle of honour and virtue, and too often hath ended in felf-murder. To this paffion every valuable confideration has been made a facrifice; and it is a paffion which has lamentably prevailed in our own country, and which we feem to have derived from our anceftors the ancient Germans; who, according to the account given of them by Tacitus (De Mor. Germ. c. 24.), were bewitched with the fpirit of play to a moft exorbitant degree. "They addict themfelves, fays he, to dice (which is wonderful) when fober, and as a ferious employment; with fuch a mad defire of winning or lofing, that, when ftripped of every thing elfe, they will ftake at laft their liberty, and their very felves. The lofer gives into a voluntary flavery, and, though younger and ftronger than his antagonift, fuffers himfelf to be bound and fold. And this perfeverance in fo bad a caufe they call the point of honour; "ea eft in re prava pervicacia, ipfi fidem vocant." One would think, fays the learned judge now cited, that Tacitus was defcribing a modern Englifhman. Againft a fpirit fo frantic, laws can be of little avail; becaufe the fame falfe fenfe of honour, that prompts a man to facrifice himfelf, will deter him from appealing to the magiftrate. Yet it is proper that reftricting and punifhing laws fhould be enacted, and that they fhould be publicly announced and repeatedly inculcated, if poffible to preferve the unwary, if not to reclaim thofe who are on the brink of ruin. Accordingly we fhall here recite fome of the principal ftatutes which the wifdom of the legiflature has formed with a view of preventing this evil.

By 16 Car. II. cap. 7. if any perfon by playing or betting fhall lofe more than 100*l*. at one time, he fhall not be compellable to pay the fame; and the winner fhall forfeit treble the value, one moiety to the king, and the other moiety to him that fhall fue for it, with treble cofts. By 9 Anne, cap. 14. 18 Geo. II. cap. 34. all notes, bills, bonds, judgments, mortgages, or other fecurities, given for money won by playing at cards, dice, tables, tennis, bowls, or other games, or by betting on the fides of fuch as play at any of thofe games, or for repayment of any money knowingly lent for fuch gaming or betting, fhall be void: and where lands are granted by fuch mortgages or fecurities, they fhall go to the next perfon who ought to have the fame, as if the granter were actually dead, and the grants had been made to the perfon fo intitled, after the death of the perfon fo incumbering the fame. If any perfon playing at cards, dice, or other game, or betting, fhall lofe the value of 10*l*. at one time, to one or more perfons, and fhall pay the money, he may recover the money loft by action of debt within three months afterward: and if the lofer does not fue, any other perfon may do it and recover the fame, and treble the value with cofts, one moiety to the profecutor, and the other to the poor; and the perfon profecuted fhall anfwer upon oath, on preferring a bill in equity to difcover what fums he hath won. And in any of thefe fuits no privilege of parliament fhall be allowed.

Perfons by fraud or ill practice, in playing at cards, dice, or by bearing a fhare in the ftakes, &c. or by betting, winning any fum above 10*l*. fhall forfeit five times the value of the thing won, and fuffer fuch infamy and corporal punifhment as in cafes of wilful perjury, being convicted thereof on indictment or information; and the penalty fhall be recovered by action, by fuch perfon as will fue for the fame; and if any one fhall affault and beat or challenge to fight any other perfon, on account of money won by gaming, upon conviction thereof by indictment or information, he fhall forfeit all his goods, and fuffer imprifonment for two years. (Stat. 9 Anne.) Alfo by this ftatute, any two or more juftices of the peace may caufe fuch perfons to be brought before them, as they fufpect to have no vifible eftates, profeffions, &c. to maintain them; and if they do not make it appear, that the principal part of their expences is got by other means than gaming, the juftices fhall require fecurities for their good behaviour for a twelvemonth, and in default of fuch fecurity, commit them to prifon until they find it: and playing or betting during the time, to the value of 20*s*. fhall be deemed a breach of good behaviour, and a forfeiture of the recognizance. Ibid.

This ftatute of Anne is farther enforced by ftat. 18 Geo. II. cap. 34, and fome deficiencies are fupplied; the forfeitures of that act may now be recovered in a court of equity: and, moreover, if any man be convicted, upon information or indictment, of winning or lofing at any fitting 10*l*. or 20*l*. within twenty-four hours, he fhall be liable to be indicted for fuch offence in fix months, either in the king's bench or at the affifes; and being convicted fhall forfeit five times the fum won or loft, which, deducting the charges, fhall go to the poor. And if any offender fhall difcover another offender, the difcoverer fhall be difcharged from all penalties by reafon of fuch offence, if not before convicted thereof, and fhall be admitted as an evidence to prove the fame. (9 Ann. c. 14.) By feveral ftatutes of the reign of king George II. *viz.* 12 Geo. II. cap. 28. 13 Geo. II. cap 19. and 18 Geo. II. cap. 34. all private lotteries by tickets, cards, or dice, and particularly the games of faro, baffet, ace of hearts, hazard, paffage, roly poly, and all other games with dice, except backgammon, are prohibited

hibited under a penalty of 200*l.* for him that ſhall erect ſuch lotteries, &c. and 50*l.* a time for the players. Public lotteries, unleſs by authority of parliament, and all manner of ingenious devices, under the denomination of ſales or otherwiſe, which in the end are equivalent to lotteries, were before prohibited by a great variety of ſtatutes, under heavy pecuniary penalties. 10 and 11 Will. III. cap. 17. 9 Anne, cap. 6. § 56. 10 Anne, cap. 26. § 109. 8 Geo. I. cap. 2. § 36, 37. 9 Geo. I. cap. 19. § 4, 5. 6 Geo. II. cap. 35. § 29, 30.

By 10 and 11 W. c. 17. all lotteries are declared to be public nuiſances; and all grants, patents, and licenſes, for ſuch lotteries, to be againſt law. Any perſon keeping or playing at a lottery ſhall forfeit 500*l.*, one-third to the king, one-third to the poor, and one-third with double coſts to him that ſhall ſue in the courts at Weſtminſter, and the offenders ſhall be proſecuted as common rogues. By 9 Anne, c. 6, any perſon who ſhall ſet up, or publiſh the ſetting up any ſuch unlawful lottery, with intent to have it drawn, ſhall forfeit 100*l.*, one-third to the king, one-third to the poor, and one-third with full coſts to him who ſhall ſue. By 10 Anne, c. 26, any perſon who ſhall keep any office for making inſurances on marriage, births, chriſtenings, or ſervices, or any other office or place under the denominations of ſales, of gloves, fans, &c. for the improvement of ſmall ſums of money, ſhall forfeit 500*l.*, one-third to the king, one-third to the poor, and one-third with full coſts to him who ſhall ſue; and every printer, or other perſon, who ſhall publiſh the ſetting up or keeping of any ſuch office or place, ſhall forfeit 100*l.* in like manner. By 8 Geo. II. c. 2. any perſon who ſhall keep any office or place, under the denomination of ſales of houſes, lands, preſentations to livings, advowſons, plate, jewels, ſhips, goods, &c. for the improvement of ſmall ſums of money; or expoſe to ſale the ſame by way of lottery, or by lots, &c. or publiſh ſchemes for advancing ſmall ſums of money by ſeveral perſons, amounting to large ſums, to be divided among them by the chances of prizes in a public lottery; or ſhall deliver out tickets, entitling them to a ſhare of the money ſo advanced; or ſhall print or publiſh any ſuch ſcheme under any denomination whatever; and ſhall be convicted, on oath of one witneſs, by two juſtices;—ſuch perſon ſhall, over and above any penalties by any former act made againſt private lotteries, forfeit 500*l.*, one-third to the king, one-third to the informer, and one-third to the poor, to be levied by diſtreſs and ſale by warrant of ſuch juſtices, and be by them committed to the county-gaol for one year, and from thence till the ſaid ſum of 500*l.* be paid; and every adventurer in ſuch ſchemes ſhall forfeit double the ſum contributed, with coſts, half to the king, and half to him who ſhall ſue: and by 12 Geo. II. c. 28, ſuch perſon ſhall forfeit 200*l.* Such ſale depending upon any ſhares or lot ſhall be void; and every adventurer ſhall forfeit 50*l.* Any perſon may be ſummoned as a witneſs, notwithſtanding his having played; and in caſe of refuſal to appear, he ſhall forfeit 50*l.*, or be committed to gaol for ſix months, 18 Geo. II. c. 34. By 27 Geo. III. c. 1. all perſons who ſhall deal in lottery tickets or ſhares, without being licenſed, ſhall be deemed rogues and vagabonds within the meaning of the 17 Geo. II. c. 5. and be puniſhed accordingly. By 34 Geo. III. c. 40. on complaint upon oath before one juſtice of any offence committed againſt the act of 27 Geo. III. c. 1. for ſuppreſſing unlawful lotteries in any houſe or place within the juriſdiction of ſuch juſtice, whereby any offenders may be liable to be puniſhed as rogues and vagabonds, doors may be broke open to ſeize ſuch perſons. By 42 Geo. III. c. 119. all games or lotteries called "little-goes" are declared to be public nuiſances; and perſons keeping places for ſuch "little-goes," or other lottery, not authorized by parliament, ſhall forfeit 500*l.* for each offence; and every ſuch perſon ſhall be deemed a rogue and vagabond within 17 Geo. II. c. 5. And perſons employing others to carry on ſuch tranſactions ſhall be puniſhable as rogues and vagabonds. Magiſtrates may authorize perſons to break open doors and ſeize offenders; and the penalty for obſtructing officers is fine, impriſonment, and public whipping at the diſcretion of the court. No perſon ſhall agree to pay money on any contingency in ſuch game or lottery, or publiſh any propoſal for the aforeſaid purpoſes, on pain of 100*l.* for each offence.

The ſtatute 13 Geo. II. c. 19. for preventing the multiplicity of horſe-races, another fund of gaming, directs, that no plates or matches under 50*l.* value ſhall be run, upon penalty of 200*l.* to be paid by the owner of each horſe running, and 100*l.* by ſuch as advertiſe the plate.

Gaming-houſes are public nuiſances, and may upon indictment be ſuppreſſed and fined. (1 Hawk. P. C. 198. 225.) Theſe are prohibited under ſevere penalties by ſeveral ſtatutes. No perſon ſhall for his gain or living, keep any common houſe or place of bowling, coyting, cloyſh, cayls, half-bowl, tennis, dicing-table, carding, or any unlawful game, on pain of 40*s.* a day; and every perſon frequenting ſuch houſes and play, and there playing, ſhall forfeit 6*s.* 8*d.* And juſtices of the peace, and the head officers of corporations, have power to enter places ſuſpected of unlawful gaming, and to arreſt and impriſon the keepers and players, till they give ſecurity to keep and reſort to ſuch houſes no longer; and ſuch officers are bound to make ſearch for ſuſpected houſes, weekly or monthly, under a forfeiture of 40*s.* a month. Farther, artificers, labourers, ſervants, &c. are prohibited to play at tables, dice, tennis, cards, bowls, &c. out of Chriſtmas, on pain of 20*s.* and in Chriſtmas only in the houſes or preſence of their maſters. 33 Hen. VIII. cap. 9. By 18 Geo. II. c. 34. no perſon ſhall keep any houſe or place for playing, or permit any perſon within ſuch houſe to play at any prohibited game, with cards or dice, under the penalties of 12 Geo. II. c. 28, above cited. Moreover, gaming in public-houſes is prohibited under a penalty to the keeper of the houſe, who knowingly ſuffers it, of 40*s.* for the firſt offence, and for every other offence 10*l.* by diſtreſs, three-fourths of which ſhall be to the poor, and one-fourth to the informer. And any journeyman, labourer, apprentice, or ſervant, who ſhall game in ſuch a houſe, ſhall forfeit, on conviction by confeſſion, or the oath of one witneſs, not more than 20*s.* nor leſs than 5*s.* at the pleaſure of the juſtice, or be committed to hard labour for a term not exceeding a month. (30 Geo. II. cap. 24.) And by 25 Geo. II. cap. 36. any houſe, or place kept for public dancing, muſic, or other entertainment, in London, or within twenty miles, (except places authorized by letters patent, or licence of the crown, or lord chamberlain,) without licence, granted at the preceding Michaelmas ſeſſions, and ſigned and ſealed by four juſtices in open court, and of which notice is given over the door or entrance of ſuch licenſed place in the following words, *viz.* "Licenſed purſuant to act of parliament of the 25th of king George the Second;" ſhall be deemed a diſorderly houſe or place, and the keeper thereof ſhall forfeit 100*l.* with full coſts. A conſtable, on notice given him in writing by any two inhabitants of the pariſh paying ſcot and lot, of any perſon keeping ſuch diſorderly houſe, and on their making oath to ſuch notice, and entering into a recognizance of 20*l.* each to produce evidence of the offence, ſhall enter into a recognizance of 30*l.* before a juſtice of the peace to proſecute ſuch perſon; and the juſtice ſhall iſſue his warrant for bringing the accuſed perſon before him,

him, and bind him over to appear at the next ſeſſions or aſſizes: if the conſtable neglect or refuſe to comply with ſuch notice, &c. he ſhall forfeit 20*l.* to each of the ſaid inhabitants; and the conſtable ſhall be allowed the reaſonable expences of the proſecution, to be paid by the overſeers of the poor; and on conviction of the offender, the overſeers ſhall pay 10*l.* to each of ſuch inhabitants, on pain of forfeiting double to the ſaid perſons.

Every ſpecies of gaming or gambling is ſtrictly forbidden in the Britiſh army; and occaſionally puniſhed with ſeverity.

The buſineſs of chance or hazard, on which the laws of gaming depend, is of mathematical conſideration; inaſmuch as it admits of more, and leſs. It is, or is ſuppoſed to be, an equality of chance, upon which the gameſters ſet out: this equality is to be broken in upon in the courſe of the game by the greater good fortune or addreſs of one of the parties, upon which he comes to have a better chance; ſo that his ſhare in the depoſit, or ſtakes, is now proportionably more or better than at firſt: this more or leſs is continually varying, and runs through all the ratios between equality and infinite difference; or from an infinitely little difference till it arrives at an infinitely great one, upon which the game is ended. The whole game, therefore, with reſpect to the event or iſſue thereof, is only a change of the quantity of each perſon's ſhare, or chance, or of the proportions their two ſhares bear to each other; which mathematics alone can meaſure.

Hence ſeveral authors have computed the variety of chance in ſeveral caſes and circumſtances that occur in gaming; for a detail of which, and the principles on which the calculations are founded, we refer to the article *Doctrine of* CHANCES. See alſo EXPECTATION and PROBABILITY.

GAMITES LAPIS, the *marriage ſtone*, a ſtone of a very ſingular kind deſcribed by Pliny, and ſome other of the ancients; he ſays it was of a white colour, and that it had in it the figure of two hands mutually infolding one another, which made it a ſymbol of that ſtate. We know nothing of any ſuch ſtone at preſent in the world; and it is eaſy to conjecture, that in Pliny's time either the ſtone muſt have been factitious, or elſe fancy muſt have been very far ſtretched to make the reſemblance.

GAMLING, in *Geography*, a river of Sileſia, which runs into the Oder, nine miles S. of Oderberg.

GAMLITZ, a town of the duchy of Stiria; 11 miles N.N.W. of Marburg.

GAMMA, or GAMMATA *Ferramenta*, an old inſtrument, uſed in *Surgery* for cauteriſing the hydrocele. It was ſhaped like the Greek letter Γ, and is mentioned by Paulus Ægineta.

GAMMACANOR, or GAMMADOUR, in *Geography*, a town of the iſland of Bachian, one of the Moluccas.

GAMMADIUM, a triangular veſtment uſed in the primitive church.

GAMMALAMENA, in *Geography*, a town of the iſland of Ternate, the uſual reſidence of the king.

GAMMARUS, in *Natural Hiſtory*, an extenſive genus of the cancri or crab tribe in the Fabrician ſyſtem, the antennæ of which are pedunculate and very ſimple. See article CANCER.

GAMME, *Fr. Gammut*, *Engl.* or *Gamma-ut*, is a title given to the muſical alphabet, or ſeries of ſounds uſed in practical melody and harmony, aſcending or deſcending in what the Greeks call the Diatonic genus, and the moderns the ſcale of Guido; that is, by tones and ſemitones.

Rouſſeau, who never ſaw the Micrologus of Guido, or any of that ingenious and celebrated monk's original writings, has given the cleareſt and beſt definition of this technical term (gammut) according to the generally received opinion.

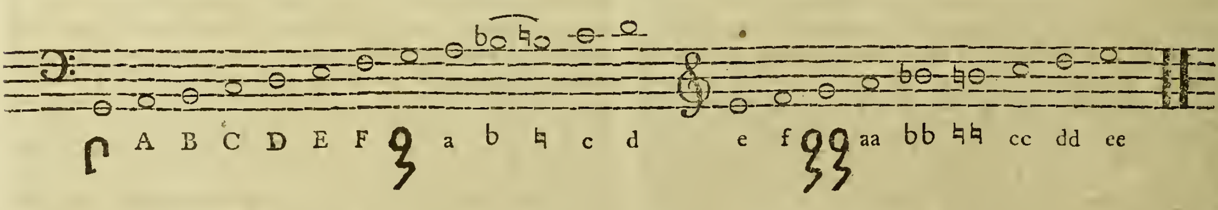
He ſays "the gammut is a table or ſcale invented by Guido d'Arezzo, by which muſical ſtudents learn to name and ſound correctly the intervals of the octave by the ſix ſyllables *ut*, *re*, *mi*, *fa*, *ſol*, *la*, according to all the arrangements that can be given them; which is called ſolmiſation," and which, like the changes on ſix bells, admit of 720 varieties.

The gammut has alſo been called *la mano armonica*, or the harmonic hand, from Guido having drawn the figure of a hand, upon the fingers of which he has arranged the notes, to ſhew the relation which the hexachords bear to the five tetrachords of the Greeks.

This hand appears in almoſt all the old muſical treatiſes in Latin and Italian, till the invention of *ſi* in France, for the ſeventh of the key of C, which has aboliſhed, in that kingdom, the mutations, and, conſequently, the harmonic hand, which taught them. See HARMONIC *Hand.*

Guido, according to the common opinion, having added a tetrachord in the acute to the diagram of the Greeks, and a ſound at the bottom, or rather, according to Meibomius, having by theſe additions reſtored the ancient diagram to its former extent, called this grave ſound (which anſwers to G on the firſt line in the baſe) *hypoproſlambanomenos*, and marked it by Γ, or gamma, the third letter of the Greek alphabet; and this letter being found at the beginning of the ſcale, for what reaſon does not clearly appear, gave birth to the barbarous name of gammut.

In the primitive ſtate of the gammut of Guido he expreſſed the ſounds by letters of the alphabet, without lines and ſpaces, or muſical characters for time; beginning with capitals for the firſt octave, minuſcules for the ſecond, and double letters for the third: as St. Gregory had done in naming the notes called Gregorian. In modern notation, the ſcale of Guido would have the following appearance, with the aſſiſtance of two different clefs, the baſe and the treble.



This gammut, in its whole compaſs, was compoſed of 20 ſounds or notes, that is, of two octaves and a major ſixth.

As to the ſyllables for naming the notes in ſinging, invented by Guido (ſee SOLMISATION and HEXACHORDS), as he has provided only for ſix of the ſounds, it was neceſſary to make the ſame notes ſerve for different purpoſes, according to the progreſs of the melody; and theſe changes were called *mutations*; which ſee.

But as to the ſyllables *ut*, *re*, *mi*, *fa*, *ſol*, *la*, taken from a hymn

hymn to St. John the Baptift (fee HYMN), they are only ufed in finging. See HEXACHORDS.

In confulting the beft elementary writers on mufic for a model of fuch a gammut as could be underftood without a mafter, or, at leaft, be fooneft learned with his affiftance, we were unable to find one that would not difcourage an incipient ftudent by its form and infertion of the tenor clef.

The gammut which Graffineau calls Guido's, and Rouffeau the Italian gammut, is fpread upon 10 lines and fpaces, in fuch a manner as a mufical ftudent, far advanced, will never find in a mufic-book, and will perplex him as much as a firft leffon, or as it would a young arithmetician by giving him a fum in the rule of three before he had learned addition.

We fhall give the following elements on a plate in the order which long experience has found to be the moft ufeful and eafily comprehended in the firft ftages of practical mufic.

1. The regular feries of natural founds, from the bottom of the piano-forte to the top, that are comprifed within the ftaff from gammut, or G on the firft line in the bafe, to *g*, fifth fpace in the treble, in the two moft common and neceffary clefs, the bafe and treble. See CLEFS.

2. The notes below and above the ftaff, or regular lines.

3. Flats, fharps, and naturals.

4. The time-table.

5. Characters of expreffion; as the flur, different kinds of bowing.

6. Graces; as the fhake, beat, and trill.

7. Tenor clefs, with the baritono clef, or bafe clef on the third line, and the French clef, or G clef on the firft line.

In the biographical article affigned to Guido, we fhall enter more at large into the hiftory of the gammut, and inquire into the validity of the ingenious monk of Arezzo's claims to many other mufical inventions of which tradition has gratuitoufly made him a prefent. See GUIDO and MICROLOGUS.

GAMMER-LAMB. See GIMMER-*lamb*.

GAMMING, in *Geography*, a town of Auftria; 10 miles E.S.E. of Bavarian Waidhofen.

GAMMING, *Markt*, a town of Auftria; 10 miles E. of Bavarian Waidhofen.

GAMMO, a town of Africa, on the Ivory coaft.

GAMMON, POINT, called formerly *Point Gilbert*, forms the eaftern fide of the harbour of Hyenis or Hyennes, in Barnftable county, Maffachufetts.

GAMMONING, on *Ship-board*, are feveral turns of rope taken round the bowfprit, and reeved through holes in the knees of the head, for the greater fecurity of the bowfprit.

GAMMUT. See GAMME.

GAMRY HEAD, on *Geography*, a cape of Scotland, on the N. coaft of Bamffhire, 6 miles E. of Bamff. N. lat. 57° 36′. W. long. 2° 20′.

GAN, a city of China, of the firft rank, and metropolis of Se-tchuen. N. lat. 31° 16′. E. long. 103° 30′. Alfo, a city of China, of the fecond rank, in the province of Pe-tcheli; 70 miles S.S.W. of Pekin. N. lat. 38° 54′. E. long. 115° 29′.

GANACHES, in the *Manege*, are the two bones, one on each fide of the hinder part of the head, oppofite to the neck, or onfet of the head, which form the lower jaw, and give it motion. It is in this place that the glands or kernels of the ftrangles, and the glanders, are placed.

GANADO, in *Geography*, a town of Africa, in Bondou; 60 miles W.S.W. of Fatteconda.

GANANOQUE, called alfo *Ganeno-coui*, a river of Upper Canada, which difcharges itfelf into the river St. Laurence, in the townfhip of Leeds. In the mouth of the river there is an excellent harbour, the water in the channel being from 12 to 15 feet deep, and the current flow. This river was called the Thames before the divifion of the province of Quebec.

GANARA, a country of Africa, in which is a town of the fame name; fituated on the banks of the Niger. The country is fertile and populous; the articles of its commerce are gold, fenna, and flaves. N. lat. 12° 20′. E. long. 16°.

GANARASKA, a river of Upper Canada, by fome called *Petuetefcoutiang*, which runs into lake Ontario on the N. fide, eaftward of Petit Efcors, and W. of Pointe aux Chevaux. A carrying place of about 11 miles lies from the mouth of this river to the Rice lake, through a country well adapted for making a road.

GANAT, a town of Africa, in the country of Sahara, inhabited by the Tuerick; 200 miles S. of Mourzouk. N. lat. 24° 40′. E. long. 13° 56′.

GANAT-*fur-Loire*, or *Gannat*, a town of France, and principal place of a diftrict, in the department of the Allier, on the Loire; 15 miles N.E. of Moulins. The town contains 5043, and the canton 12,521 inhabitants, on a territory of 192½ kiliometres, in 12 communes.

GANCHE, *Fr.* derived from the Italian *ganus*, *hook*, a kind of gallows or gibbet ufed for the punifhment of criminals in Turkey. The executioner raifes the condemned by means of a pulley, and, fuddenly flackening the rope, lets them fall on hooks of iron, which entangle and rend their bodies: in this condition they are left to die, and fome have been known to languifh for two or three days.

GAND, in *Geography*. See GHENT.

GANDAMUS, in *Ancient Geography*, a town of Arabia Felix, upon the Red fea. Pomp. Mela.

GANDARA, a town of India, in the country called Gandarica by Steph. Byz.; different from the Gandarides of Pliny and Ptolemy, near the mouth of the Ganges.

GANDARUSSA, or GANDEROSA, in *Botany*, the Malay name of a fpecies of *Jufticia*, *J. Gandaruffa*, Linn. Suppl. 85, under which that plant is much celebrated in the popular fongs of Java.

GANDASULI, GANDASULIUM, Rumph. Amb. v. 5. 175. t. 69. f. 3. See HEDYCHIUM *Coronarium*.

GANDE, in *Geography*, a river of Germany, which runs into the Lune; four miles W.S.W. of Gandersheim.

GANDELI, a town of Italy; 20 miles N.E. of Bergamo.

GANDERSHEIM, a town of Germany, in the principality of Wolfenbuttel, fituated on the river Gande, and having a celebrated abbey of Proteftants, under the direction of an abbefs, who is a princefs, and four ladies of noble families; 33 miles S.W. of Brunfwick. N. lat. 51° 51′. E. long. 10° 1′.

GANDEUSEN, a town of Algiers; 40 miles W.S.W. of Tubnah.

GANDGOURLY, a town of Hindooftan, in Golconda, at the union of the Manzorah and Godavery; 40 miles N.W. of Indelovoy.

GANDHAR, a town of Hindooftan, in the circar of Rantampour; 30 miles S.S.W. of Rantampour.

GANDJA, or GANGEA, a town of the principality of Georgia;

Georgia; 100 miles S.E. of Teffis. N. lat. 41° 32'. E. long. 45° 10'.

GANDIA, a walled fea-port town of Spain, in the province of Valencia, half a league from the coaft, between the mouth of the Xucar and Cape Martin, on the rivulet Alevi, 40 miles S.S.E. of the capital, in a fertile, delightful, and populous territory, almoft furrounded by a ridge of low hills, and wholly cultivated, except a low marfhy tract towards the coaft, which is often inundated. The ducal palace is a magnificent edifice. N. lat. 39'. W. long. 0° 19'.

GANDICOTTA, a town and fortrefs of Hindooftan, fituated on the top of a lofty mountain, on the fouth bank of the river Pennar, in the circar of Cuddapa. The road to it is narrow, and formed in the rock, by the fide of a frightful precipice. Below is a fmall plain, watered by a number of fprings, in which the inhabitants cultivate rice and millet. Near it is a diamond mine, 33 miles N. W. of Cuddapa. N. lat. 44 55'. E. long. 78 29'.

GANDINA, a town of Italy, in the department of the Adda and Oglio; 10 miles N. E. of Bergamo.

GANDOLA, a town of Italy, in the department of the Serio; eight miles N.W. of Bergamo.

GANDOVA, a river of Abyffinia, which runs into the Tacazé, 60 miles S. of Dekin.

GANE, a town of Arabia Felix; 150 miles N. of Mocha.—Alfo, a city of Africa, and capital of a country, governed by a fultan, fubject to Houffan, on the N. fide of the Niger, near a lake. Hornemann cal's it *Cano;* 600 miles E. of Tombuctoo. N. lat. 16° 10'. E. long. 12° 40.

GANEGAM, a town of the ifland of Ceylon; 60 miles S. S. E. of Columbo.

GANET Islands, a clufter of fmall iflands, near the eaft coaft of Labrador. N. lat 54°. W. long. 56 10'.

GANEYGON, a town of Hindooftan, in Dowlatabad; 33 miles S. W. of Amednagur.

GANG, in the *Sea Language,* fignifies a crew.

To man a boat is called, to *put a gang of men* (which is a company) into her; they are commonly called the *cockfwain's* gang, who have the charge of her.

Gang-*fifh*, in *Ichthyology*, a name given by fome authors to a fmall fifh caught in the German lakes, and fent in pickle into many parts of the world. The more ufual name of this fifh among writers is lavaretus. See Salmo *Lavaretus.*

Gang-*ladder*, in *Canals*, a frame anfwering the fame purpofe as a *Horfing-block*, which fee.

Gangs-*men*, in *Canal-making*, is a term for fmall companies of men who undertake the labour of digging, embanking, or puddling a canal, refervoir, &c.

Gang-*ox*. See Ox.

Gang-*waggons*, or trams, &c. are names for the carriages, whether conftructed of iron or wood, which are ufed for the conveyance of goods on rail-ways or tram-roads. See Canal, and Rail-ways.

Gang-*water*. See Water-*gang*.

Gang-*way*, in *Mining*, fignifies a paffage, audit, or gate through which the miners pafs underground; fometimes thefe are laid with iron or with wooden rails, for the trams or gang-waggon wheels to move on, or are laid with round logs of wood acrofs, if the floor is foft and fubject to fwell, on which the corves flide, as they are dragged along to the fhaft bottom by the miners, or by the mine affes or horfes.

Gang-*way* is applied to all the feveral entrances, ways, or paffages, from one part of the fhip to the other.

Whatfoever is put in any of thefe paffages, is faid to be laid or put in the gang-way.

Gang-*way* alfo denotes that part of a fhip's fide, both within and without, by which the paffengers enter and depart: it is for this purpofe provided with a fufficient number of fteps, or *cleats*, nailed upon the fhip's fide, nearly as low as the furface of the water; and fometimes furnifhed with a ladder, whofe lower end projects from the fhip's fide, being fecured in this pofition by iron braces.

GANGA, in *Ornithology*, a name given by Buffon to the Tetrao *Alchata*, which fee.

GANGACOTTY, in *Geography*, a town of Thibet; 68 miles S. of Gangotri.

GANGALAGUTTA, a town of Hindooftan, in the circar of Cuddapa; 34 miles N. of Combam.

GANGAMAR, a town of Thibet; 18 miles S. of Jhanfu-Jeung.

GANGAPATNAM, a town of Hindooftan, in the Carnatic, at the mouth of the Pennar; 80 miles N. of Madras. N. lat. 14° 25'. E. long. 80° 12'.

GANGARIDÆ, in *Ancient Geography*, a people of India, near the mouth of the Ganges, to whom Ptolemy affigns a capital called Gangia Regia, on the other fide of the river, placed by M. D'Anville in lat. 24° 50'. See Gour.

GANGARONO, a fmall ifland in the gulf of Venice. N. lat. 44 12'. E. long. 15° 35'.

GANGART, in *Mining*, fignifies the fides or walls of the vein or working; for which alfo the terms fkirts, vein-fkirts, woughs, &c. are ufed, in different mineral diftricts. See Vein.

GANGELT, in *Geography*, a town of France, in the department of the Roer, 12 miles S. S. E. of Ruremond. N. lat. 50° 58'. E. long. 5 59'.

GANGES, a town of France, in the department of the Herault, and chief place of a canton, in the diftrict of Montpellier, and 21 miles N. of it. The place contains 3622, and the canton 7339 inhabitants, on a territory of 157½ kiliometres, in 10 communes.

Ganges, a river of Afia, which in the language of Hindooftan is called *Pudda*, or *Padda;* and it is alfo named *Burra Gonga*, or the Great river, and *Gonga*, the river, by way of eminence; and hence the European names of the river are derived. It has, not unaptly, been denominated the twin-fifter, or rival of the *Burrampooter* (which fee), from the contiguity of their fprings, and from their refemblance to each other in length of courfe, in bulk till they approach the fea, in the fmoothnefs and colour of their waters, in the appearance of their borders and iflands, and finally, in the height to which their floods rife, with the periodical rains. The Ganges, as well as the Burrampooter, has its fource in the vaft mountains of Thibet; and thefe two rivers proceed in oppofite directions. The former feeks the plains of Hindooftan by the weft, and purfues the early part of its courfe through rugged vallies and defiles, and feldom vifits the habitations of men. After wandering about 800 miles through thefe mountainous regions, it iffues forth a deity to the fuperftitious, yet gladdened, inhabitant of Hindooftan. From the fabulous account of its origin we learn, that it flows out of the foot of Befchan (the fame with Viftnou, or the preferving deity), whence, according to the Bramins, it has its name "Pudda;" fignifying in the Shanferit language foot; and that in its courfe to the plains of Hindooftan it paffes through an immenfe rock, fhaped like a cow's head. This river was unknown to Herodotus, as he does not mention it, though it became famous in a century afterwards. Major Rennell, in fumming up the whole information, collected from the different accounts of the upper part of the courfe of the Ganges, obferves, that the two branches of it, which fpring from the weftern fide of mount Kentaiffe, take their courfe weftward, inclining confiderably to the north for a courfe of about

300 miles, in direct distance; when meeting the great chain or ridge of mount Himmaleh, which extends from Cabul along the north of Hindoostan, and through Thibet, the rivers are compelled to turn to the south; in which course they unite their waters, and form what is properly termed the river Ganges. This great body of water now forces a passage *through* the ridge of mount Himmaleh, at the distance, possibly, of 100 miles below the place of its first approach to it, and, sapping its very foundation, rushes through a cavern, and precipitates itself into a vast bason, which it has worn in the rock, at the hither foot of the mountains. The Ganges thus appears, to incurious spectators, to derive its original springs from this chain of mountains; and the mind of superstition has given to the mouth of the cavern the form of the head of a cow; an animal held by the Hindoos in a degree of veneration, almost equal to that in which the ancient Egyptians held their god Apis. From this second source, as it may be termed, of the Ganges, its course becomes more eastwardly than before, through the rugged country of Sirinagur, until at Hurdwar it finally escapes from the mountainous tract, in which it has wandered for about 800 British miles.

The true origin of the Ganges was explored, so lately as the year 1717, by persons deputed by the emperor Camhi for this purpose; and after a journey of about 2.500 British miles from the head of the Ganges, they brought some of its water back with them to Pekin. Until the result of this expedition was known in Europe, it was believed, on the testimony of the Hindoos, that the springs of the Ganges were at the foot of mount Himmaleh, or Imaus.

At Hurdwar, or Hurdoar, in latitude 30°, it opens itself a passage through mount Suvalick, or Suva-luik, or the chain of mountains that borders on the level country, on the north of the province of Delhi; and after gushing through this opening, it flows with a smooth navigable stream through delightful plains during the remainder of its course to the sea, which is about 1350 miles, diffusing plenty immediately by means of its living productions, and secondarily, by enriching the adjacent lands, and affording an easy means of transport for the productions of its borders. In a military view, it opens a communication between the different posts, and serves as a military way through the country, renders unnecessary the forming of magazines, and infinitely surpasses the celebrated inland navigation of North America, where the *carrying places* not only obstruct the progress of an army, but enable the adversary to determine his place and mode of attack with certainty.

The Ganges, in its course through the plains, receives 11 rivers, some of which are equal to the Rhine, and none smaller than the Thames, besides as many others of lesser note. To this vast influx of streams it is owing, that the Ganges exceeds the Nile so much in point of magnitude, while the latter exceeds it by one-third in length of course. Indeed, the Ganges is, in this last respect, inferior to many of the northern rivers of Asia; though Mr. Rennell thinks that it discharges as much or more water than any of them, because those rivers do not lie within the limits of the periodical rains.

The bed of the Ganges is very unequal with respect to width. From its first arrival in the plains at Hurdwar, to the conflux of the Jumnah, the first river of note that joins it, its bed is generally from a mile to a mile and a quarter wide, and, compared with the latter part of its course, tolerably straight. Hence, downward, its course becomes more winding, and its bed wider, till, having successively received the waters of the Gogra, Soane, and Gunduck, besides many smaller streams, its bed has attained its full width; although, during the remaining 600 miles of its course, it receives many other principal streams. Within this space it is, in the narrowest parts of its bed, half a mile wide, and in the widest, three miles, even where no islands intervene. The stream within this bed is always either increasing, or decreasing, according to the season. When at its lowest, which happens in April, the principal channel varies from 400 yards to $1\frac{1}{4}$ mile; but is commonly about $\frac{3}{4}$ of a mile in width. This river is fordable in some places above the conflux of the Jumnah, but the navigation is never interrupted. Below that, the channel is of considerable depth; for the additional streams bring a greater accession of depth than width. At 500 miles from the sea, the channel is 30 feet deep when the river is at its lowest; and it continues, at least, at this depth to the sea, where the sudden expansion of the stream deprives it of the force necessary to sweep away the bars of sand and mud thrown across it by the strong southerly winds; so that the principal branch of the Ganges cannot be entered by large vessels. See DELTA *of the Ganges*, and HOOGLY *River*.

The general descent of the Ganges does not exceed four inches *per* mile; and the mean rate of its motion is less than three miles an hour, in the dry months. In the wet season, and whilst the waters are running off from the inundated lands, the current runs from five to six miles an hour, and in certain circumstances and situations it runs seven or eight miles. Mr. Rennell mentions an instance, in which a boat was carried, against a strong wind, 56 miles in eight hours. Considering that the velocity of the stream is three miles in one season, and five or more in the other, on the same descent of four inches *per* mile; and that the motion of the inundation is only half a mile *per* hour, on a much greater descent, no farther proof is required, how small the proportion of velocity is that is communicated by the descent. It is then, says Mr. Rennell, to the *impetus* originating at the spring-head, or at the place where adventitious waters are poured in, and successively communicated to every part of the stream, that we are principally to attribute the velocity; which is greater or less according to the quantity of water poured in. The windings of the Ganges in the plains are, without doubt, owing to the looseness of the soil; and major Rennell alleges as a proof of this, that they are perpetually changing; which those, originally induced by an inequality of surface, can seldom or never do. Appearances, says this ingenious writer, favour very strongly the opinion, that the Ganges had its former bed in the tract now occupied by the lakes and morasses, between Nattore and Jaffiergunge; striking out of its present course at Bauleah, and passing by Pootyah. With an equal degree of probability (favoured by tradition), we may trace its supposed course by Dacca, to a junction with the Burrampooter, or Megna, near Fringybazar: where the accumulation of two such mighty streams probably scooped out the amazing bed of the Megna. For an account of the openings that form the mouths of the Ganges; see DELTA *of the Ganges*. The sand and mud-banks at this time extend 20 miles off some of the islands, in the mouths of the Ganges and Burrampooter; and in many places rise within a few feet of the surface. Some future generation will probably see these banks rise above water, and succeeding ones possess and cultivate them. Of the islands formed in the channel of the Ganges, some are four or five miles in extent, which are formed at the angular turnings of the river, and were originally sand-banks thrown up round the points, and afterwards insulated by breaches of the river; and others are formed in the straight parts of the river, and in the middle of the stream, owing their origin to some obstruction lurking at the bottom, and rapidly accumulating. The river borrows on each side to supply

fupply the deficiency in its bed; and in fuch parts of the river fteep banks occur on both fides. Thefe are increafed by many periodical floods, and at length acquire mould fufficient for the purpofes of cultivation. Whilft the river is forming new iflands in one part, it is fweeping away old ones in other parts.

Mr. Rennell, in accounting for the annual fwelling and overflowing of the Ganges, obferves, that it owes its increafe as much to the rain-water that falls in the mountains contiguous to its fource, and to the fources of the great northern rivers that fall into it, as to that which falls in the plains of Hindooftan; the quantity of fnow melted in the mountains contributing only in a fmall proportion to its increafe; for it rifes 15½ feet out of 32 (the fum total of its rifing) by the latter end of June; and it is well known, that the rainy feafon does not begin in moft of the flat countries till about that time. In the mountains it begins early in April; and by the latter end of that month, when the rain-water has reached Bengal, the river begins to rife but by very flow degrees; for the increafe is only about an inch *per* day for the firft fortnight. It then gradually augments to two or three inches before any quantity of rain falls in the flat countries; and when the rain becomes general, the increafe, on a medium, is five inches *per* day. See Bengal.

The following table fhews the gradual increafe of the Ganges and its branches, according to obfervations made at Jellinghy and Dacca.

	At Jellinghy.		At Dacca.	
	Ft.	Inch.	Ft.	Inch.
In May it rofe	6	0	2	4
June	9	6	4	6
July	12	6	5	6
In the firft half of Auguft	4	0	1	11
	32	0	14	3

The quantity of the daily decreafe of the river is nearly in the following proportion: during the latter half of Auguft, and the whole of September, from three to four inches; from September to the end of November, it gradually leffens from three inches to 1½ inch; and from November to the latter end of April, it is only half an inch *per* day at a medium. Thefe proportions relate to fuch parts of the river as are not affected by the tides. The following circumftance is remarked by Mr. Rennell as attending the increafe of the Ganges; *viz.* that there is a difference in the quantity of the increafe in places more or lefs remote from the fea, as exhibited in the preceding table. It is a fact, he fays, confirmed by repeated experiments, that from about the place where the tide commences to the fea, the height of the periodical increafe diminifhes gradually, until it totally difappears at the point of confluence; and this is perfectly conformable to the known laws of fluids. The ocean preferves the fame level at all feafons (under fimilar circumftances of tide), and neceffarily influences the level of all the waters that communicate with it, unlefs precipitated in the form of a cataract. Could we fuppofe, for a moment, that the increafed column of water, of 31 feet perpendicular, was continued all the way to the fea by fome preternatural agency; whenever that agency was removed, the head of the column would diffufe itfelf over the ocean, and the remaining parts would follow, from as far back as the influence of the ocean extended; forming a flope, whofe perpendicular height would be 31 feet. This precifely correfponds to the fact. At the point of junction with the fea, the height is the fame in both feafons at equal times of the tide. At Luckipour, there is a difference of about fix feet between the heights in the different feafons; at Dacca, and places adjacent, 14; and near Cuftee, 31 feet. Here is a regular flope; for the diftances between the places bear a proportion to the refpective heights. This flope muft add to the rapidity of the ftream; for, fuppofing the defcent to have been originally four inches *per* mile, this will increafe it to about 5½. Cuftee is about 240 miles from the fea, by the courfe of the river; and the furface of the river there, during the dry feafon, is about 80 feet above the level of the fea at high-water. The tides in the river Amazons are perceptible at 600 miles above its mouth; but at an elevation of only 90 feet, according to M. De Condamine. Thus far does the ocean manifeft its dominion in both feafons; in the one by the ebbing and flowing of its tides; and in the other by depreffing the periodical flood, till the furface of it coincides as nearly with its own, as the defcent of the channel of the river will admit. Similar circumftances take place in the Jellinghy, Hoogly, and Burrampooter rivers, and, as Mr. Rennell fuppofes, in all others that are fubject to periodical or occafional fwellings. Not only is the flood diminifhed near the fea, but the river banks are diminifhed in the fame proportion; fo that in the dry feafon the height of the periodical flood may be known by that of the bank.

The quantity of water difcharged by the Ganges, in one fecond of time, during the dry feafon, is 80,000 cubic feet; but in the place where the experiment was made, the river, when full, has thrice the volume of water in it; and its motion is alfo accelerated in the proportion of five to three; fo that the quantity difcharged in a fecond at that feafon is 405,000 cubic feet. If we take the medium the whole year through, it will be nearly 180,000 cubic feet in a fecond. Rennell's Memoir. Phil. Tranf. vol. lxxi.

Ganges, in *Ancient Geography*, *Mowil-Garga*, a very large river in the ifland of Taprobana, according to Ptolemy. It defcended from high mountains in the centre of the ifland, and difcharged itfelf into a large bay fituated about the middle of the eaftern coaft.

Ganges *Iflands*, or *North Natunas*, in *Geography*, two fmall iflands between the ifland of Borneo and the gulf of Siam. N. lat. 4° 55′. E. long. 106° 45′.

GANGI, a town of Sicily, in the valley of Demona; 14 miles S. W. of Miftretta.

GAN-GIN, a town of China, of the third rank, in Houquang; 36 miles E.S.E. of Heng-tche.

GANGLION, (a primitive Greek word) denotes, in *Anatomy*, the fmall fwellings found in certain parts of the nervous fyftem. See the account *of the ftructure of the nerves* in the article Brain. The particular ganglions are defcribed in the article Nerve.

Ganglion, in *Surgery*, is a term applied to a kind of tumour which generally forms upon the tendinous, or ligamentous parts of the limbs. The fwelling is very prominent, and circumfcribed, and is always connected with fome tendon, or aponeurofis underneath. The difeafe is generally unattended with pain, the only inconveniences being, more or lefs, deformity, and fometimes fenfation of weaknefs in the performance of fome particular motion. However, it behoves every furgeon and patient to be aware that, though ganglions are for the moft part not ferioufly troublefome while free from ulceration, yet it fometimes happens, that in confequence of their being imprudently punctured, or otherwife irritated, they are converted into very dangerous fungous, and cancerous difeafes. (See Medical Journal, vol. v.) A ganglion is fo much like an encyfted tumour of the meliceris kind, that many furgical writers have treated of fuch difeafes under the fame head.

The

The ganglion, indeed, is compofed of a tendinous cyft, which is filled with a fluid refembling white-of-egg. The chief circumftance in which it differs from a common encyfted tumour, is in having a clofe attachment to fome tendon or ligamentous expanfion underneath.

The parts moft frequently attacked with ganglions are the hands and feet; but there are inftances of thefe tumours making their appearance upon many other fituations in the body. Mr. Warner met with an extraordinary example of this kind, where the tumour poffeffed the whole back part of the neck.

Ganglions fometimes take their rife from a ftrain or bruife; and, at other times, they happen without any previous accident. It is not common for them to grow to a very large fize; but on certain occafions they have done fo, and proved very inconvenient, by depriving the part of its ftrength and motion.

Ganglions are unattended with any difcolouration of the fkin, and, on being compreffed, appear to poffefs a great deal of elafticity.

Thefe tumours admit of being cured in various ways, fome of which are more certainly efficacious, and freer from objections than others. The chief means are friction, with ftimulating difcutient applications, fetons, preffure, ftriking the tumour with fome hard body, and excifion.

With refpect to ftimulating difcutient applications, they are ufed with a view of producing an abforption of the fwelling, an attempt which more frequently fucceeds in this fort of cafe than in any other kind of tumour, putting out of confideration a few particular excrefcences of a warty nature. The moft common difcutient application for ganglions is the oleum origani, with which thefe fwellings are to be rubbed two or three times a day. Mr. Warner found that faponaceous liniments, mixed with opium, and plafters, compofed of foap and mercury, had the greateft power in difperfing this defcription of tumours, and that, in many inftances, they fully anfwered his purpofe. In other cafes, he obferves, that camphorated mercurial ointment will be found fuccefsful. Bliftering the fkin which covers a ganglion, and keeping up a difcharge from the excoriated furface, by means of the favine ointment, is another plan of cure to be mentioned with topical difcutients.

When an endeavour is to be made to effect the abforption of a ganglion, we are of opinion that the moft eligible method, generally fpeaking, is to rub the tumour with the oleum origani, or one of the applications recommended above by Mr. Warner. We fhould not be inclined to have recourfe to the bliftering plan, except, perhaps, in a few obftinate cafes.

Sometimes, by the foregoing meafures, particularly when thefe are affifted by conftant preffure on the tumour, a ganglion may be effectually removed. Very frequently, however, the fwelling only undergoes a temporary diminution, and returns to its former magnitude fhortly after the applications are difcontinued.

Setons are a dangerous and painful means of cure, and we earneftly recommend them never to be tried with a view of removing ganglions. We have already ftated, that while a ganglion is free from irritation and ulceration, the complaint is by no means fevere; but that when it has burft, or been punctured, it fometimes changes into a terrible and fatal difeafe. In the fifth volume of the London Medical Journal, we may find an impreffive cafe, in which the fungus hæmatodes was produced by an attempt to cure a ganglion with a feton. Were we to fuppofe the plan fuccefsful, ftill it would be objectionable, on account of its neceffarily fubjecting the patient, for a certain time, to fome confiderable pain, as well as troublefome fores, while milder and more infallible methods might be chofen.

Keeping up a conftant preffure on a ganglion, by binding a piece of fheet-lead upon the tumour, is a very eligible plan to be tried in the firft inftance, efpecially when aided by occafional frictions with fome of the above-mentioned difcutient remedies. Sometimes a complete cure is thus accomplifhed; fometimes only a temporary diminution of the fwelling; as the fluid foon accumulates again, in confequence of the cavity of the cyft not being obliterated by an adhefion of its oppofite fides to each other.

The next practice which we have to notice, is that of ftriking a ganglion with the fift, a hammer, or the back of a book. We have heard of feveral inftances in which the fwelling has thus been very expeditioufly and permanently cured. It feems probable that the blow ruptures the fac, drives out the fluid into the furrounding cellular fubftance, and occafions an inflammatory affection of the cyft, ending in the obliteration of the cavity for the fluid. We have never adopted this method ourfelves, from an averfion to running any rifk of making the tumour inflame and ulcerate, and becaufe we have generally found fuccefs attend frictions with liniments, oleum origani, or camphorated mercurial ointment, when aided by the preffure of a piece of lead.

Inftances, however, are not uncommon, in which all attempts to difperfe a ganglion prove ineffectual. When this is the cafe, and the parts become difabled from the fize and fituation of the fwelling, the furgeon is warranted in extirpating the difeafe with a knife. The manner of doing this operation is very fimilar to that of removing encyfted tumours. (See Extirpation.) Some practitioners have been fearful of cutting away ganglions, from an idea, that unpleafant fymptoms would arife from wounding the fubjacent tendon, or ligamentous expanfion. Such apprehenfion, however, feems to be ill-founded, as many cafes are related in furgical books of ganglions being removed with a knife with the utmoft fuccefs. It is not always neceffary to injure, in any material degree, the fubjacent tendon, the chief objects of the operator only being to cut the fwelling from the furface underneath, to take out the cyft entire, that is to fay, without wounding it, or leaving any particle of it behind, and then to bring the edges of the wound together with fticking plafter. Some preffure fhould alfo be made on the part with a comprefs of lint and a bandage.

In order to fhew that a ganglion may, in cafe of its refifting other plans, and becoming troublefome, be fafely cured by excifion, we fhall quote the following cafe. "A young woman, 19 years of age, ftrained her wrift by a fall. The accident was immediately followed by great pain, and a weaknefs and fwelling of the whole hand. Notwithftanding proper methods were tried for her relief, the injured part continued much in the fame ftate for four years. A fmall diftinct tumour was now difcovered, arifing from the inner and lower part of her wrift, and, in a few days, the fwelling became fo large as to hinder the patient from fhutting her hand, or moving her fingers. When the part was fhewn to Mr. Warner, he felt in the tumour a fluid, which extended about an inch above the tranfverfe ligament of the wrift, and about half an inch below it; and which upon preffure feemed to pafs under the ligament. Mr. Warner undertook the cure by extirpation. He began an incifion a little above the upper part of the fwelling, and continued the cut through the integuments to a little beyond the lower part. He then diffected up the fkin on each fide, and was thus enabled to fee the exact fituation of the tumour, which lay under the tendons of the flexor carpi ulnaris, and palmaris longus mufcles, both of which were con-

fiderably lifted up, and removed from their natural fituation, by the fubjacent tumour. The ganglion alfo extended under the tranfverfe ligament of the wrift, which part it was neceffary to divide, before the bafe of the tumour could be diffected off. The lower part of the cyft adhered to the tendons of the extenfor mufcles, from which the whole was feparated by means of the knife. In fix weeks the patient got well, without any confiderable inflammation or abfcefs, and regained the ufe of her hand." (See Warner's Cafes, p. 165.) Two other cafes are recorded by the fame author of ganglions being fuccefsfully cured by extirpation. Mr. Warner is candid enough to allow, that, in fome inftances, he had feen inflammations and abfceffes follow the operation; but, he adds, that he never knew one cafe that did not terminate well.

Mr. Gooch, in the fecond volume of his chirurgical works, relates a cafe which he alfo cured with the knife. P. 376.

Heifter likewife ftates, that he has feveral times cut away ganglions with fuccefs.

Whenever a ganglion is unufually large and troublefome, and does not yield to preffure and difcutients, we fhould generally recommend its removal with a knife.

If the cafe be in a ftate of ulceration, the fooner the operation is done the better, by reafon of the danger of the difeafe now putting on a malignant character. While no ulcer exifts, a fimple longitudinal cut through the integuments fuffices; but when the fkin is ulcerated, and the tumour has burft, the furgeon muft begin his operation by making an oval or circular incifion, which will take away all the difeafed part of the integuments.

Mr. Warner does not mention that he brought the lips of the wound together with fticking-plafter, or applied a comprefs; but when thefe things are attended to, we have no doubt that the generality of patients will be well in a much fhorter fpace of time than fix weeks after the operation.

We have not noticed the propofal of curing ganglions with cauftic; we deem it highly objectionable, and hope that, in future, no refpectable furgeon will ever put it in practice. Irritating a ganglion with cauftic is a moft likely method of converting the fwelling into a very dangerous difeafe.

GANGOUTRA, fignifying the *fall* or *cafcade* of the Ganga or Ganges, in *Geography*, a cavern, ftyled by the Hindoos the "Cow's mouth," through which the Ganges paffes. The *Upper* Gangoutra is about 280 or 300 road miles above Hurdwar, where the Ganges enters the plains of Hindooftan, placed by Tienfentaller in the parallel of 33° N. The *Middle* Gangoutra is at Deuprag, where the Baghyretty, fuppofed by Major Rennell to be the true head of the Ganges, and the Alacknundra rivers, the former from the N. and the latter from the N. E. join at a few miles diftance below Sirinagur, there forming the *Proper* Ganges of Hindooftan. The *Lower* Gangoutra is the opening in mount Sewalick, at Hurdwar, through which it iffues. See GANGES.

GANGPOUR, a circar of Hindooftan, in the country of Oriffa, bounded on the north by Jufhpour and Bahar, on the eaft by Konjoor, on the fouth by Sumbalpour, and on the weft by Ruttunpour. The chief towns are Gangpour and Pada.

GANGPOUR is the capital of the circar, and is diftant 244 miles W. from Calcutta. N. lat. 21° 2'. E. long. 84° 10'.

GANGRA, in *Ancient Geography*, a town of Paphlagonia, the refidence of Mopfus, king of the country, which fent fuccours to the Galatians againft the Romans in the time of Antiochus the Great.—Alfo, a town of Arabia Felix. Steph. Byz.

GANGRÆNA ORIS. This denotes, in *Surgery*, a deep, irregular, ill-conditioned ulcer, fituated on the infide of the lips and cheek. The preceding name is that which was adopted by Van Swieten; but the difeafe has had feveral other appellations beftowed upon it. Sennertus denominates it *aphthæ ferpentes;* while the generality of the French writers call it *gangrène fcorbutique des gencives*. It has alfo been named *labrofulcium*, and *cheilocace cancrum oris*, &c.

The malady is generally attended with a copious fecretion of the faliva; and it commonly affects children under feven years of age, and feldom grown up perfons. The edges of the ulcer are remarkably jagged, and, when the complaint attacks the infide of the lip, the ulceration fpreads with celerity to the infide of the cheek, which fwells and feels hard. The gums are fometimes involved in the difeafe, while the teeth are loofe and carious. Abfceffes may alfo occur, and burft in various adjoining fituations. It is faid, that exfoliations fometimes take place from the alveolar proceffes, and other parts of the lower jaw-bone.

The gangræna oris, for the moft part, is found to affect the children of the poor, or fuch as refide in damp places, are not kept duly clean, live on bad food, and are much crowded together. The exact caufe of the malady, however, is unknown. When the affection is neglected, it may produce moft dreadful degrees of floughing.

Although the gangræna oris is uncommon in adults, they are fometimes afflicted with it.

The internal treatment, recommended by authors, confifts principally of milk and vegetable diet, bark, vitriolic acid, porter, &c.

The applications to the difeafe itfelf may be diluted vitriolic acid, burnt alum, the tincture of myrrh, the decoction of bark with the fulphate of zinc, or a mixture of lime-water and fpirit of wine, as may be found to agree beft. Sometimes thefe applications may be ufed as gargles; fometimes by wetting in them foft pieces of lint, which are to be put and kept upon the fore.

GANGRÆNA *Offis*, fometimes denotes a caries; fometimes the difeafe known by the name of fpina ventofa.

GANGRENE, derived from the Greek γαίνω, *to feed upon*, becaufe the flefh is eaten away or deftroyed by it. The expreffion is very commonly ufed in the fame fenfe as the word *mortification*, which, we know, denotes the death of fome part of the body. However, it is to be obferved, that when the whole, or a confiderable portion of a bone dies, without any of the flefh being involved in fimilar mifchief, the cafe is not denominated a *gangrene*, but a *necrofis*, as we fhall have occafion to explain more fully in a future volume of this Cyclopædia.

Although gangrene and mortification are not unfrequently employed fynonymoufly by many refpectable writers and practitioners, yet a diftinction is fometimes drawn, of which we fhall prefently make mention.

Mortification is a diforder which arifes from an immenfe number of different caufes, and, of courfe, it varies very confiderably in the manner of its attack, its progrefs, and degree of danger. The cafes of the difeafe are frequent, and, as they often put the life of the patient into a ftate of imminent peril, always ftand in need of judicious furgical affiftance, and have been indifcriminately treated of by many writers, we feel that the fubject before us admits of much ufeful difcuffion. We fhall find that a good deal of error has prevailed in the general treatment of mortifications, principally, in confequence of that blind enthufiafm which exaggerated the

the Peruvian bark into a ſpecific for every kind of gangrene. It is far from our intention to ſay, that this medicine has not often done good in theſe caſes; we acknowledge that it has been highly ſerviceable in numerous inſtances; but we have no heſitation in aſſerting, that much harm has alſo ariſen from exhibiting bark in ſome examples in which it was not indicated, and from overloading the ſtomach with it on other occaſions, where the medicine might have been productive of real good, had it only been preſcribed with moderation.

Nor has the topical treatment of gangrene always been ſuch as ſhould entitle it to approbation. Of late years, indeed, the proper kind of local applications, and the circumſtances in which making inciſions into the part affected can prove uſeful. have been explained. Yet what man, that has ſeen any thing of ſurgery, can conſcientiouſly declare, that modern practice is altogether delivered from ſome abſurd prejudices about the virtues of a certain claſs of remedies, denominated antiſeptics?

We truſt, that the correctneſs of the preceding criticiſms will become the more ſtriking, the further the reader advances in the peruſal of the account which we have to offer of the ſubject, and the more he compares our ſtatement with the facts demonſtrated to him by experience.

We ſhall firſt detail the common ſymptoms and appearances attendant on ſuch mortifications as are preceded by inflammation.

When the mortification is beginning, the pulſe immediately becomes much weaker, and ſometimes irregular; the patient experiences a conſiderable proſtration of all the vital powers; and, after a violent increaſe of ſuffering, the pain in the part affected undergoes a ſudden diminution. A diſagreeable hiccough, repeated ſickneſs, and different degrees of delirium, are alſo the frequent concomitants of this ſort of local miſchief.

In the ſeat of the inflammation the integuments are affected with a livid diſcolouration, and change ſucceſſively from a red to a yellowiſh, and, laſtly, a greeniſh hue. The cuticle, in various places, riſes in the form of veſicles, which are generally filled with a turbid fluid. The ſwelling, tenſion, and hardneſs ſubſide, and, on touching the part, a crackling ſenſation is communicated to the fingers, owing to the generation of air in the cellular ſubſtance. Still, however, the part is not completely dead, as it retains ſome of its natural warmth and ſenſibility. It is particularly to this firſt ſtage of mortification that the term *gangrene* is applied.

When the organization of the parts is totally deſtroyed, together with all veſtiges of their natural ſtructure, and the gangrenous place is converted into a cold, black, fibrous, inſenſible maſs, a *ſphacelus*, or *complete mortification*, is ſaid to have happened.

A portion of the ſoft parts, in this dead, black condition, is technically named a *ſlough*, except when the piece of fleſh has been killed with cauſtic or fire, in which caſe the part which is deſtroyed is more frequently called an *eſchar*.

When any conſiderable portion of the body is affected with mortification, the conſtitution always ſeems to ſuffer a ſudden and an alarming ſhock. The eyes immediately exhibit that peculiar appearance, which Mr. Pott, in his book on ruptures, has diſtinguiſhed by the name of lack-luſtre. The whole ſyſtem is terribly dejected; the countenance all at once puts on a wild, wretched, cadaverous look; the pulſe generally becomes ſmall, rapid, and, as we have already ſtated, in ſome inſtances irregular; the ſkin is moiſtened with cold, clammy perſpirations; an inceſſant purging is apt to occur, and, frequently, the unhappy patient, after being more or leſs delirious, falls a victim to the diſorder.

We think, that the beſt general diviſion of mortification is that adopted by Mr. John Hunter, who remarks, that all theſe caſes are of two kinds; the one, without inflammation; the other, preceded by it.

This celebrated ſurgeon regarded inflammation as an increaſed action of that power which a part naturally poſſeſſes. It was his opinion that ſuch an affection (when of the healthy ſort) was probably attended with an increaſe of power; but, ſays he, in inflammations which terminate in mortification, there is no increaſe of power, but, on the contrary, a diminution of it. He thought that this loſs of power becomes, when joined to an increaſed action, a cauſe of mortification, by deſtroying the balance which ought to ſubſiſt between the power and the action of every part.

Mr. Hunter makes mention, alſo, of certain caſes of mortification, which, though they are preceded by inflammation, do not depend wholly upon it as a cauſe, but ſeem to have ſome peculiarity in their nature. Of this kind are the carbuncle, and the ſlough formed by the ſmall-pox puſtule. (See Hunter on the Blood, Inflammation, &c. p. 8.)

Let us now take a view of the various remote cauſes of gangrene and ſphacelus. Inflammation is the firſt, which deſerves particular attention. Parts which are violently and extenſively inflamed are frequently obſerved to mortify. However, it is not uſual for common phlegmonous inflammation to end in ſuch miſchief, unleſs the ſtate of the conſtitution is very bad, or the parts affected happen not to be endued with ſtrong vital powers, or are in a dropſical or paralytic condition. Eryſipelas often brings on mortification; and ſo does an exceedingly vehement ſpecies of inflammation, ſometimes known by the name of irritative. Phlegmon generally ends in reſolution; ſometimes, in ſuppuration; ſeldom in gangrene. At the ſame time, every man, at all converſant with ſurgery, knows, that any ordinary inflammation is apt to induce a mortification when the patient's habit is particularly weak, irritable, or unhealthy, or when the ſyſtem is conſiderably reduced by the effects of old age. It is alſo a well-known fact, evinced by daily experience, that very ſlight inflammations of anaſarcous and paralytic parts will bring on gangrene. It is on this account that making ſcarifications in the ſcrotum, or any of the limbs affected with anaſarca, is not altogether free from dangerous conſequences. There are likewiſe particular parts of the body, which cannot bear much inflammation, without inevitably falling into a ſtate of mortification. Of this nature are all tendons and faſciæ, which often ſlough, while the ſkin, which covers them, is not affected with the ſame kind of diſorder. The reaſon of this circumſtance ſeems imputable to the inferior vaſcularity of all tendinous ſtructures. The ſkin, which is at the ſame time inflamed, appears to be ſaved by being highly organized, exceedingly vaſcular, and endued with great vitality. When parts of new formation are affected with common inflammation, they are always very prone to mortify, and this circumſtance is probably owing to the ſame principle, which makes inflamed tendons and faſciæ ſo readily ſlough; for, all ſarcomatous and encyſted tumours, as well as all excreſcences, warts, &c. are, in the opinion of modern pathologiſts, furniſhed with leſs vitality than the generality of ſuch parts as enter into the natural and original formation of the body.

Of the ſeveral remote cauſes of gangrene, eryſipelas is thought to be the moſt frequent; for, whenever this ſpecies of inflammation falls into the ſuppurative ſtate, a great deal of ſloughing is always produced wherever the matter happens to be ſituated; and ſince, in eryſipelatous abſceſſes, the pus is not confined by any ſurrounding cloſure of the interſtices of the cellular ſubſtance with coagulating lymph, we find that the matter generally finds its way very extenſively

fively in different directions, occafioning gangrenous diforder wherefoever it happens to fpread. In many of thefe inftances all the floughing is beneath the fkin, chiefly affecting the fafciæ, tendons, and cellular fubftance. In fome cafes, the high vafcularity of the fkin does not altogether fave it, a portion of it dying, and turning black. On fome occafions, the quantity of integuments deftroyed is large; in other examples it is fmall, while the fubjacent gangrenous mifchief is confiderable. Sometimes, alfo, when floughing is the confequence of eryfipelas, the ravages are not confined to the cellular fubftance, tendons, aponeurofes, and fkin; but the mufcles, large veffels, and bones are alfo deftroyed, fo that the whole thicknefs of the limb is left in a complete ftate of fphacelus.

Any thing which entirely cuts off the requifite fupply of blood to a part may be the occafion of a mortification. The knowledge of this circumftance fometimes leads to a rational method of curing polypi, and other morbid excrefcences. The furgeon knows, that, if he can fucceed in putting a tight ligature round the necks of fuch tumours, the circulation of blood in the fwellings will be ftopped, and they of courfe will flough and fall off. The effects of ftopping the flow of blood into parts are often feen in cafes of ftrangulated herniæ and wounded arteries, and when a bandage is applied with unwarrantable tightnefs. Surgical writers mention the occurrence of mortification from aneurifmal tumours, and other large fwellings, the preffure of which is reprefented as hindering the influx of blood into the part. The offified ftate of the arteries, in old perfons, is alfo fet down as becoming a caufe of mortification, by impeding the due fupply of blood.

Mortification will alfo be occafioned by any circumftance which entirely prevents the return of blood from a part. In this cafe, the blood-veffels become turgid, and the part is quickly affected with pain, fwelling, and lividity. Vefícles foon arife, and, at length, the feat of the diforder becomes foft, œdematous, emphyfematous, cold, black, infenfible, and fetid. Here the fymptoms are fomewhat different from fuch as attend a mortification from fome impediment to the entrance of arterial blood into the part. In the latter inftance, the part is faid to be at firft affected with foftnefs and coldnefs, and a diminution of its fize; then it becomes infenfible, fhrivelled, black, and lifelefs.

Mortification frequently attacks patients whofe complaints compel to remain a long while in bed in the fame pofture. In this example, the floughing is chiefly attributable to the unremitted preffure which parts fuftain, and which obftructs the circulation. Surgeons have frequent opportunities of beholding melancholy inftances of this kind of mortification, particularly in cafes of fractures, paralyfis from difeafed vertebræ, &c. The mifchief moft readily occurs where the bones have the leaft flefh upon them, and, confequently, where all external preffure muft operate with the greateft effect; as, for inftance, about the os facrum, os ilium, trochanter major, the fpine of the fcapula, &c. The difordered part, in this cafe, always becomes at firft foftifh, livid, red at the circumference, and œdematous, afterwards entirely lofing its fenfibility, and acquiring a black appearance. When the flough is detached, a foul fpreading ulcer is always left. The preffure on parts, from long confinement in one pofture, more readily occafions mortification, when the conftitution is particularly circumftanced. Previous fever, dropfy, paralyfis, the languid circulation of old age, &c. all render the diforder more eafy of production.

Some of the remote caufes of mortification operate by actually fubverting the organization of the part. Bad comminuted compound fractures, attended with extenfive injury of the foft parts, and a wound of the main arteries of the limb; very large contufed lacerated wounds, &c. thus induce gangrene and fphacelus. The action of fire and cauftic fubftances may be faid to bring on floughing on the fame principle; for a total deftruction of all natural organization muft be the confequence of the chemical decompofition of any part of the animal body. We fhould obferve, however, that the heat applied muft be very great to kill and decompofe the flefh at once; and that, when mortification arifes from burns, under any other circumftances, the affection muft be preceded by inflammation.

Long expofure to certain degrees of cold will often give rife to gangrene and fphacelus, particularly when the benumbed frozen parts are imprudently expofed, all at once, to the fire. In this circumftance, a violent ungovernable inflammation is fuddenly excited, which rapidly ends in a mortification. Bad chilblains afford a mild example of fuch a cafe; while a fevere one may be feen in the fphacelus of a whole extremity. Cold will more readily make parts flough, when the fyftem is debilitated by poor living, or any previous difeafe. We have feen, in the hofpitals of the metropolis, many Lafcars, whofe feet had mortified in confequence of the cold of this climate, and want of proper nourifhment. In former times, alfo, numerous Africans out of flave fhips ufed to be feen in the London hofpitals, whofe limbs were fometimes in a ftate of fphacelus, from the combined effect of cold, poor living, and ill-treatment, and fometimes, as we are forry to remark, from the cruel preffure of their irons. The treatment of frozen and froft-bitten parts we fhall prefently confider.

The furunculus and carbuncle are difeafes which are always attended with a greater or a lefs degree of gangrenous diforder, as the reader may learn more particularly by a reference to thofe articles.

Mortification is ftated to originate fometimes from unknown epidemic caufes; and inftances are mentioned, in which all the fores and wounds in a large hofpital have become, about the fame time, affected with gangrene. Gangrene and fphacelus fometimes proceed from inexplicable caufes. The occafion of that fpecies of mortification, which begins in one of the toes, and extends thence up the leg, is not exactly underftood. We fhall prefently introduce Mr. Pott's interefting obfervations on this particular cafe.

Having noticed the general fymptoms of mortification, the principal remote caufes, and the divifion of the diforder into two kinds, one preceded by inflammation, the other not, we now proceed to the confideration of fome other circumftances which require explanation, before we begin to fpeak of the treatment.

Befides the divifion of mortifications into fuch as are preceded by inflammation, and into others which are not, furgical authors have made fome other diftinctions; for inftance, the *dry* and *humid* gangrenes; the *white* gangrene, &c. The two firft kinds are characterifed by the little or great quantity of moifture about the fphacelated part. Hildanus, Tulpius, Quefnay, Bertrandi, and others have treated of the dry gangrene in their refpective writings.

In the *white* gangrene, the mortified parts are faid not to turn black, but to retain nearly their natural colour. Quefnay has taken particular notice of this curious variety of the diftemper.

A mortified part may be confidered, in relation to the reft of the body, as an extraneous fubftance, the feparation of which will be equally conducive to the comfort and recovery of the patient. However, it fhould be known, that a flough does not admit of removal as foon as it is formed; for although there is no vital connection between the dead and living

living matter, yet a mechanical union exifts until the abforbent veffels have had time to take away fuch particles as connect the found flefh with the dead mafs. Were a furgeon imprudently to ufe force for the purpofe of tearing away an extenfive mortified part, he would fubject the patient to the danger of a renewal of the floughing, put him to unwarrantable pain, and bring on a hæmorrhage, which, in a debilitated ftate of the fyftem, might lead to fatal confequences. The detachment of a flough is altogether the work of nature, and the furgeon can only ufefully interfere in removing fuch portions of the mortified mafs as are completely loofe. When a mortification ceafes to fpread, the adjoining edge of the living part foon exhibits the appearance of a red line, or border, which is a fign much taken notice of by all experienced furgeons; becaufe it fhews that the fpreading of the mortification has ftopped, and that the limb, which could not prudently be amputated before, may now be removed, if circumftances make the proceeding neceffary. Soon after the red line of feparation appears, fuppuration commences. At firft, a fmall quantity of matter iffues from the fpace between the flough and the living furface, and the difcharge of purulent matter gradually becomes more and more copious. The pus is of courfe fecreted from the veffels of the living part; but it muft be manifeft, that before the matter can be poured out, a fpace muft be formed for it between the flough and the living parts. The prefent received opinion is, that fuch an interfpace is produced by the action of the abforbent veffels, which are on the living furface, and which, in fact, effect the detachment of the dead mafs, by removing fuch particles of matter as connect it with the living flefh. The inflammation which arifes on the living edge, as foon as the mortification ceafes to fpread, and which precedes the detachment of the flough, feeming effential to the completion of that procefs, is faid to depend chiefly upon the prefence of the flough, which operates as an extraneous fubftance on the living matter with which it is in contact. Thus, the living furface is made to inflame, redden, and fuppurate.

Some philofophizing writers affect to ridicule the opinion, that the feparation of a dead from a living part is chiefly accomplifhed by the action of the abforbent veffels, or, by what a formal modern author is pleafed to term the "mordicant powers of abforbent orifices." (See Pearfon's Principles.) Thefe fages, however, do very wrong to torture their intellectual powers with fubjects which, of all others, are the leaft calculated to receive elucidation from fuch dim rays as emanate from ordinary genius. To any man free from the vanity of fetting up fome new weak hypothefis, and of endeavouring to fubvert the better eftablifhed opinions of others, merely to make way for the infignificant offspring of his own fancy, there will be no more difficulty in conceiving how any of the particles of the body can be taken away by one fet of veffels, called abforbents, than in conceiving how fuch particles can be depofited by another order of veffels, named arteries.

It is a curious circumftance, in the hiftory of mortification, that the blood coagulates for fome way up the large arteries which lead into the mortified portion of a limb. Were it not for this event, the feparation of the dead part would generally be productive of a fatal hæmorrhage.

There is a fpecies of fphacelus which fpreads with immenfe rapidity, and is exceedingly dangerous, hardly leaving any time for the trial of remedies. Sometimes, however, a mortification fpreads fo flowly, that it does not occupy much extent at the end of feveral months; yet the cafe is frequently not the lefs fatal on this account. The danger is never altogether paft until the dead part is feparated. It is faid, that long after a mortification has ceafed to fpread, the patient may die in confequence of the abforption of fome of the putrid matter into the circulation. With regard to the prognofis, we can only offer a few general remarks. The degree of danger will always be, in a great meafure, proportioned to the fize of the part affected, and its importance in relation to the neceffary operations of the animal economy. The event of every cafe will alfo be confiderably influenced by the age and conftitution of the patient.

In forming a judgment concerning the hope of a recovery, we fhould not be entirely actuated by fuperficial appearances. Often, when a part looks quite black and completely fphacelated, its total deftruction does not enfue; for in many cafes the diforder only affects the fkin and cellular fubftance. The integuments frequently flough away, and we have the happinefs to find that the tendons, mufcles, and other organs underneath, are perfectly found, fo that ftrong hopes of a recovery may be juftly entertained.

No favourable prognofis can ever be delivered while a mortification is in a fpreading ftate. Nor fhould any flattering profpects be held out in any inftance in which the quantity of floughs and putrid matter is large, and the patient old and vaftly debilitated. After the deftructive procefs has ftopped in the part, the ravages may be too great for the fyftem to repair, and the difcharge too copious and weakening; or the patient may fuddenly perifh, as authors affert, in confequence of the effects of putrid matter abforbed into the circulation.

Treatment of Gangrene and Sphacelus.—The treatment of every kind of mortification is divided into *conftitutional* and *local*; the firft comprifing fuch internal remedies as are indicated by the ftate of the general fyftem; the fecond comprehending whatever is neceffary to be applied or done to the mortified part itfelf.

When a mortification is in a fpreading ftate, is the confequence of violent inflammation, and is attended with a ftrong, full, frequent pulfe, and other fymptoms of inflammatory fever, the antiphlogiftic treatment is obvioufly indicated. As for the part which is already fphacelated, no kind of furgery can reftore it to its original ftate; with refpect to the living circumference, which is in danger of being next deftroyed, and which may be materially affected by the conduct of the practitioner, in what other ftate can it be regarded, except that of fuch vehement inflammation as is the forerunner of gangrene? Hence, the fame kind of conftitutional treatment is required as in other inflammatory cafes, namely, bleeding, purging, antimonials, low diet, &c. However, there is this difference, that as the fyftem always foon fuffers a confiderable dejection, and the ftrength fuddenly finks, when a large portion of the body mortifies, the furgeon is obliged to be very cautious in not carrying the plan of evacuations too far. Were he to employ the lancet, and exhibit purgatives as freely as in any common inftance of phlegmonous inflammation, the patient would often be reduced, partly by the difeafe, and partly by the treatment, into a ftate of debility, from which no fucceeding fkill could extricate him.

As the change from the violence of inflammation into gangrene and fphacelus is always attended with a fevere degree of pain, it is indifpenfably proper to adminifter opium, with a view both of alleviating the fufferings, and procuring fleep.

Numerous practitioners, and, we may fay, the majority of writers, recommend the exhibition of bark in the preceding inftance, though as far as our obfervations extend, without either being influenced by any rational principles, or at all encouraged by unqueftionable fuccefs. For, admitting

mitting that bark has the wonderful virtue of directly imparting ſtrength to the human conſtitution, how inconſiſtent it ſeems at once to adopt meaſures which lower the ſyſtem, and put in practice other things which tend to ſtrengthen! We wiſh, however, our cenſures on this uſe of bark only to extend to the period while the mortification is accompanied with conſiderable inflammation, and the ſtrong actions of the common inflammatory fever; for when this ſtage is over, we agree that all evacuations ſhould be omitted, and a tonic treatment be immediately followed.

The partiſans of the Peruvian bark have, indeed, the authority of Mr. Hunter on their ſide, who thought it a ſingularly efficacious medicine in all caſes of mortification preceded by inflammation, inaſmuch as he believed it had the peculiar virtue of increaſing the powers, and leſſening the action in the part. What man of experience, however, who is not a bigot to theory, can ſuppoſe that bark will actually diminiſh the action in a part affected with the higheſt degree of inflammation? If it poſſeſſes this miraculous quality, why is it not regularly preſcribed in all caſes of inflammation? Why not put at the head of the liſt of antiphlogiſtic remedies? In practice, we could never find a fact in proof of the alleged property of bark in leſſening action. We believe that the reaſon of this medicine being indiſcriminately given in every ſtage and ſpecies of mortification, is referable to cauſes which were ably pointed out by that excellent practical ſurgeon Mr. Samuel Sharp, whoſe obſervations we ſhall preſently quote.

We are happy in finding ſome practitioners yet unblinded by prejudices in favour of bark. Among theſe we have to notice the reſpectable German ſurgeon, Richter. This experienced writer remarks, that there are three different kinds of fever, which are obſerved to be attendant on the various ſpecies of mortification, namely, the ſympathetic inflammatory fever, one accompanied by extreme debility, being in all probability of a typhoid nature; and another fever, which ſeems to be intimately connected with a diſordered ſtate of the abdominal viſcera.

The inflammatory fever takes place when the mortification is the conſequence of acute inflammation, which has been produced by ſome external injury in a healthy conſtitution. Here, ſays Richter, bark is in general hurtful.

The ſecond fever, which we have juſt mentioned, certainly demands the exhibition of bark.

The third, however, or that which is dependent on diſorder of the chylopoietic organs, is not likely to be benefited by bark, becauſe one of the principal indications is to procure free evacuations from the ſtomach and bowels. See Richter's Anfangsgründe der Wundarzneykunſt, Baud I. Kap. 3.

Our chief wiſh, in the foregoing remarks, is to convince the reader, that while a gangrene is ſpreading, attended with a ſtrong frequent pulſe and other ſymptoms of inflammatory fever, and while the local miſchief is ſurrounded by acute inflammation, the treatment ſhould be of the antiphlogiſtic kind, and bark need not be adminiſtered, a moderate employment of evacuations being the moſt likely means of averting the deſtruction which impends over the highly inflamed parts, which are immediately around ſuch as are already dead.

Inconſiſtent, however, as the practice of giving barks in this inflammatory ſtage of mortification appears to us, we are far from ſaying any thing againſt the exhibition of the medicine the moment the ſtrong actions of the inflammatory fever ceaſe, and ſigns of approaching debility commence. All evacuations muſt now be diſcontinued, and the patient's ſtrength ſupported by every means in our power. The moſt rational mode of effecting this object undoubtedly conſiſts in giving ſuch food as is at once the moſt nouriſhing and moſt eaſy of digeſtion, ſuch as jellies and good ſoups. Bark may now be advantageouſly employed, if only given in moderation, ſo as to improve the tone, inſtead of oppreſſing the functions of the digeſtive organs. With bark, the practitioner may join the vitriolic acid, laudanum, aromatic confection, or æther, as his diſcretion may direct. The patient ſhould alſo be allowed a moderate quantity of Madeira, or port wine, and either ale, porter, or cyder, as may agree with his conſtitution beſt. In ſome caſes brandy may be given with great benefit, and the uſe of opium ſhould ever be remembered.

Whenever bark is indicated in caſes of mortification, we conceive that the moſt eligible way of deriving benefit from it is to preſcribe moderate quantities of the medicine, perhaps about two ounces of the decoction, with a little of the tincture, about three times a day. We decidedly reprobate the plan of cramming the ſtomach with the decoction, tincture, and powder, all made into a thick mixture. We have ſeen ſome hoſpital ſurgeons in this city eagerly ſeize every opportunity in theſe caſes of preſcribing the foregoing farrago, ſometimes denominated the *bark in full*, as if the degree of benefit would certainly be in a ratio to the quantity of the medicine crammed down the patient's throat. Such practitioners muſt ſurely entertain ſtrange notions, both of the virtues of bark, and of the nature of the human alimentary canal. They muſt ſuppoſe that a certain portion of ſtrength will be extracted from every grain of ſolid bark, which can juſt be got down the revolting œſophagus into the ſtomach. When the medicine is in the latter place, they ſeem to fancy that a degree of vigour, proportioned to the weight and quantity of the remedy ſwallowed, will ſurely be extricated from the miraculous mixture by the digeſtive organs, and infuſed into the ſyſtem. They alſo appear to think that the ſtomach and bowels muſt be as inſenſible as leathern bags, or dead bladders, into which any quantity of a thing may be ſtowed without the leaſt harm, ſo that they do not actually burſt.

Our ſentiments are far different. We believe that bark has no direct power of imparting ſtrength to the human conſtitution, and that it has a ſtrengthening effect only in as much as it improves the tone of the ſtomach, with which it comes into contact. If this be correct, how unlikely is it that any good will be produced by loading the ſtomach and bowels with as much of the medicine as the patient can be made to ſwallow. Will not ſuch a method be more oppreſſive than beneficial to the digeſtive organs? Is not the abſurdity of the practice diſplayed every day? Do we not ſee the patients themſelves remonſtrating? Do they not frequently make complaint that the bark ſickens, purges, and ſo diſorders them, that they can keep no nouriſhment within them, and that inſtead of being ſerved by the remedy, they are almoſt killed by it? Let bark only be given in the way which we have adviſed, and whatever good it is capable of doing will be obtained.

Sometimes bark will produce purging, though adminiſtered with moderation, in which circumſtance a few drops of the tinctura opii ſhould be added to each doſe. Frequently the ſtomach will not bear the decoction of this medicine. In ſuch caſes bark ſhould be tried in the form of a very ſubtile powder, or the infuſion, or the tincture, may be exhibited.

Thus we ſee, that in caſes of gangrene bark is ſometimes proper, ſometimes inefficacious, and ſometimes abſolutely pernicious, and that it can only be conſidered as a uſeful medicine when preſcribed by practitioners of diſcrimination.

mination. We fee, alfo, that in certain inftances of mortification, although bark is at firft improper, it is afterwards ftrongly indicated by the change of circumftances.

We have ftated, that bark fhould be adminiftered whenever any fpecies of gangrenous diforder is attended with a ftate of the fyftem, refembling that which occurs in typhus fever, and, generally, whenever great debility is decidedly prefent. The anthrax, or carbuncle, we know, is a difeafe always attended with more or lefs floughing, as well as with a depraved conftitution, and a remarkable proftration of ftrength. Bark is found, in this inftance, to be followed by the moft beneficial effects.

It is alfo a highly valuable medicine in almoft all mortifications which are the confequence of eryfipelatous inflammation. Let it ever be recollected, however, that, in no cafe, ought bark to be given in immoderate dofes, nor when it difagrees with the ftomach and bowels.

One principal caufe, which has induced furgeons to order bark in all cafes of mortification, without the leaft diftinction, is the manner in which this medicine has been puffed off as a *fpecific* for gangrenous diforders, which it has been alleged to ftop by fome peculiar virtues, which no other article of the materia medica poffeffes. The dark days of prejudice, however, have feldom been altogether deftitute of fome few difcerning men, whofe abilities and ftrength of underftanding have not fuffered them to be deceived and led aftray by the vague opinions of the multitude. Among fuch exalted characters, Mr. Samuel Sharp, furgeon of Guy's Hofpital, merits a confpicuous place. Notwithftanding he lived in times when bark was praifed up to the fkies, and reprefented, in almoft every publication of the day, as curing fome melancholy fpecimen of mortification, he never allowed himfelf to be blinded by any paper affertions, nor his eyes to be turned away from the facts which prefented themfelves in his own extenfive practice. The following obfervations of this experienced furgeon are as pertinent and interefting now, as they were at the period when they were originally publifhed. "There has lately ftarted up in Great Britain a new practice of treating this complaint (meaning a mortification), which, at prefent, makes fome noife in other parts of Europe, and is therefore worth our attention. Every body will immediately conclude, that I mean the cortex peruvianus, which, within thefe few years, has been fo exalted for its virtues in ftopping a gangrene, that the cautery itfelf was not more efteemed amongft the ancients, than is this medicine by fome of the moderns. I know it will be looked upon by many as a kind of fcepticifm to doubt the efficacy of a remedy fo well attefted by fuch an infinity of cafes; and yet I fhall frankly own, I have never clearly, to my fatisfaction, met with any evident proofs of its preference to the cordial medicines ufually prefcribed; though I have a long time made experiment of it, with a view to fearch into the truth.

"Perhaps it may feem ftrange thus to difpute a doctrine eftablifhed on, what is called, matter of fact; but I fhall here obferve, that, in the practice of phyfic and furgery it is often exceedingly difficult to afcertain a fact. Prejudice, or want of abilities, fometimes mifleads us in our judgment, where there is evidently a right and a wrong; but, in certain cafes, to diftinguifh how far the remedy, and how far nature operate, is probably above our difcernment. In gangrenes, particularly, there is frequently fuch a complication of unknown circumftances, as cannot but tend to deceive an unwary obferver. Mortifications, arifing from mere cold, compreffion, or ftricture, generally ceafe upon removing the caufe, and are, therefore, feldom proper cafes for proving the power of bark. However, there are two kinds of gangrene where internals have a fairer trial; thefe are a fpreading gangrene from an internal caufe, and a fpreading gangrene from violent external accidents, fuch as gun-fhot wounds, compound fractures, &c. Yet, even here, we cannot judge of their effect with abfolute certainty; for fometimes a mortification from internal caufes is a kind of critical diforder. There feems to be a certain portion of the body deftined to perifh, and no more. Of this we have an infinity of examples brought into our hofpitals, where gangrene ftops at a particular point, without the leaft affiftance from art. The fame thing happens in the other fpecies of gangrene from violent accidents, where the injury appears to be communicated to a certain diftance, and no farther; though, by the way, I fhall remark in this place, contrary to the received opinion, that gangrenes from thefe accidents (where there has been no previous ftraightnefs of bandage) are as often fatal, as thofe from internal caufes.

"As I have here ftated the fact, we fee how difficult it is to afcertain the real efficacy of this medicine; but had bark, in any degree, thofe wonderful effects in gangrenes which it has in periodical complaints, its pre-eminence would no more be doubted in the one cafe than in the other. What, in my judgment, feems to have raifed its character fo high, are the great number of fingle obfervations publifhed on this fubject, the authors of which not having frequent opportunities of feeing the iffue of this diforder, under the ufe of cordials, &c. and fome of them, perhaps, prejudiced with the common fuppofition, that every gangrene is of itfelf mortal, have therefore afcribed a marvellous influence to the bark, when the event has proved fuccefsful." (See Critical Enquiry, &c. chap. on Amputations.)

We fhall now conclude the fubject of bark in cafes of mortification. We have not allowed this medicine any direct power of imparting ftrength, neither have we admitted, that it at all deferves the name of a fpecific in checking the progrefs of gangrene and fphacelus. We have ftated our belief, that it can only be the means of fupporting the ftrength inafmuch as it may improve the tone of the digeftive organs. With thefe principles, we have condemned the practice of making the patient take immoderate quantities of the remedy; fo as to diforder, inftead of meliorating, the ftate of the ftomach and bowels. We have maintained, that bark is never indicated when the mortification is fpreading, in confequence of acute inflammation, in a patient not deficient in ftrength; and when the affection is either attended with inflammatory fever, or with another fever depending on diforder of the chylopoietic organs. In this laft inftance, the firft indication is to empty the primæ viæ, and, afterwards, bark may be given, if circumftances require it. We have allowed, that moderate dofes of bark may be exhibited with advantage in almoft every fpecies of mortification, immediately when evident figns of debility make their approach, fo that the medicine will often be proper after a certain time, though it may not be indicated in the commencement of the cafe.

When a mortification is fpreading in a very old, enfeebled patient, bark may be prefcribed with opium, cordials, and aromatic medicines; but we again repeat our own fentiment, that, whenever the indication is to fupport the ftrength, it is much more rational to endeavour to effect this object by eligible kinds of nourifhment, than by overloading the ftomach with any kind of medicine whatfoever.

There is a particular fpecies of mortification, beginning in the toes, and extending gradually to the foot and leg, and deferving particular notice, as being an inftance in which

which bark is univerfally allowed to fail. This cafe is remarkable, alfo, on account of its not being benefited by that grand remedy, notwithftanding the frequent concomitant evils of debility and old age. The late able Mr. Pott, whofe writings fhew, that he had as much faith in bark as moft furgeons, could not acknowledge its efficacy in the inftance to which we are alluding. The diftemper begins at the extremity of one or more of the fmall toes, and fooner or later paffes on to the foot and ankle, and fometimes to a part of the leg, in former times, moft commonly deftroying the patient, in fpite of all the aid of phyfic and furgery.

The annexed defcription of the difeafe and its treatment is from the pen of Mr. Pott, whofe furgical works are equally recommended by the practical knowledge which they contain, and by the fine animated ftyle in which they are written.

He remarks, that this cafe " is very unlike to the mortification from inflammation, to that from external cold, from ligature, or bandage, or to that which proceeds from any known and vifible caufe, and this as well in its attack as in its procefs. In fome few inftances, it makes its appearance with little or no pain; but, in by much the majority of thefe cafes, the patients feel great uneafinefs through the whole foot and joint of the ankle, particularly in the night, even before thefe parts fhew any mark of diftemper, or before there is any other, than a fmall difcoloured fpot on the end of one of the little toes.

" It generally makes its firft appearance on the infide, or at the extremity, of one of the fmaller toes, by a fmall, black, or blueifh fpot: from this fpot the cuticle is always found to be detached, and the fkin under it to be of a dark red colour.

" If the patient has lately cut his nails, or corn, it is moft frequently, though very unjuftly, fet to the account of fuch operation.

" Its progrefs in different fubjects, and under different circumftances, is different; in fome it is flow and long in paffing from toe to toe, and from thence to the foot and ankle; in others its progrefs is rapid, and horridly painful: it generally begins on the infide of each fmall toe, before it is vifible either on its under or upper part; and when it makes its attack on the foot, the upper part of it firft fhews its diftempered ftate, by tumefaction, change of colour, and fometimes by vefication; but wherever it is, one of the firft marks of it is a feparation or detachment of the cuticle.

" Each fex is liable to it; but for one female in whom I have met with it, I think I may fay, that I have feen it in at leaft twenty males. I think, alfo, that I have much more often found it in the rich and voluptuous, than in the labouring poor; more often in great eaters, than free drinkers. It frequently happens to perfons advanced in life, but is by no means peculiar to old age. It is not, in general, preceded or accompanied by apparent diftemperature either of the part, or of the habit. I do not know any particular kind of conftitution which is more liable to it than another; but as far as my obfervation goes, I think that I have moft frequently obferved it to attack thofe, who have been fubject to flying uncertain pains in their feet, which they have called gouty, and but feldom in thofe who have been accuftomed to have the gout regularly and fairly. It has, by fome, been fuppofed to arife from an offification of veffels; but for this opinion I never could find any foundation but mere conjecture.

" The common method of treating this diftemper is, by fpirituous fomentations, cataplafms actually and potentially warm, by dreffings of the digeftive kind, as they are called, animated with warm, pungent oils and balfams, &c. and, internally, by the Peruvian bark.

" I wifh I could fay that this, which, with little alteration, has been the general practice, had been moft frequently, or even often fuccefsful; but I am, from long and repeated experience, obliged to fay, that it has not.

" I am fenfible, that many of my readers will be furprifed at my affirming, that the Peruvian bark will not ftop a mortification, a diftemper in which, for fome years, it has been regarded as fpecific; but I muft beg not to be mifunderftood: I mean to confine my obfervation and my objection to this particular fpecies of mortification, which I regard as being fui generis: and under this reftriction I muft repeat, that I have feldom, if ever, feen the bark fuccefsful: in all other cafes, wherein it is ufed or recommended, no man has a higher opinion of it; but, in this I cannot give it a praife, which it does not deferve.

" I believe I may venture to fay, that I have tried it as fairly, as fully, and as varioufly as any man has or can: I have given it in the largeft quantity, at the fhorteft intervals, and for the longeft poffible fpace; that is, as long as the patient's life would permit: I have given it by itfelf in decoction, extract, and fubftance; I have combined all thefe together; I have joined it with nitre, fal. abfynth. with fnake-root, with confect. cardiac. with volatile falts, and with mufk, as different circumftances feemed to require, or admit: I have ufed it as fomentation, as poultice, as dreffing; I have affifted it with every thing which has been ufually thought capable of procuring, or affifting digeftion; ftill the diftemper has continued its courfe, perhaps a little more flowly, but ftill it has ended in death.

" I am forry to rob one of our great medicines of any part of its fuppofed merit, but as on the one hand, its claim, in this inftance, is unjuft, and as on the other, I hope to add as much to the character of another, the res medica will be no fufferer.

" Some time ago, I had a patient labouring under this complaint, who, from antipathy, obftinacy, or fome other caufe, could not be prevailed on to take bark in any form whatever. I made ufe of every argument, but to no purpofe: fomentation, poultice, and the ufual dreffings were applied in the ufual manner; the difeafe advanced fome days more, fome days lefs, and at the end of a fortnight the fmall toes were all completely mortified, the great one become blackifh, the foot much fwollen, altered in colour, and the difeafe feeming to advance with fuch hafty ftrides, that I fuppofed a very few days would determine the event. The pain in the foot and ankle was fo great, and fo continual, as totally to deprive the patient of fleep. On this account, and merely to procure fome remiffion, I gave two grains of opium at night, which not having the defired effect, I repeated it in the morning. Finding, during the following day, fome advantage, I repeated the fame dofe night and morning, for three days; at the end of which time the patient became quite eafy, and the appearances on the foot and ankle were vifibly more favourable. Encouraged by this, I increafed the quantity of the medicine, giving one grain every three or four hours, taking care to watch its narcotic effect, and to keep the belly empty by glyfters. In nine days from the firft adminiftration of the opium, all the tumefaction of the foot and ankle totally fubfided, the fkin recovered its natural colour, and all the mortified parts plainly began to feparate; in another week they were all loofe, and cafting off, the matter was good, and the incarnation florid. During the whole of this time, I continued the ufe of the opium, varying its quantity as circum-

circumſtances required, but never gave leſs than three or four grains in twenty-four hours.

"When the ſloughs were all caſt off, the bones ſeparated, and I had only a clean ſore to dreſs and heal, I gradually left off the medicine.

"I am very willing to acknowledge, that however well-pleaſed I might be with the event of this caſe, yet I really regarded it as accidental; ſo much ſo, that having very ſoon after another opportunity, I did not care to truſt to opium alone, but joined the bark with it. The event was equally fortunate. But although I had joined the cortex with the extractum thebaicum, and did therefore attribute the ſucceſs to their united powers, yet the effect was ſo very unlike to what I had ever ſeen from the bark without opium, that I could not avoid ſeriouſly, and often reflecting on it, and determining to uſe it by itſelf, whenever another opportunity ſhould offer. I did ſo, and ſucceeded in the ſame happy manner, though under the very diſagreeable circumſtances of ſeventy years of age, a broken, diſtempered conſtitution, and the diſeaſe making a haſty progreſs.

"To relate caſes which are nearly, or at leaſt materially ſimilar, is of no uſe: I ſhall therefore only ſay, that every opportunity, which I have had ſince of making the experiment, has ſtill more and more convinced me of the great value and utility of this medicine, and of its power of reſcuing from deſtruction perſons under this affliction.

"I cannot ſay that it has never failed me: it certainly has; but then it has been under ſuch circumſtances, as I think would fairly account for the failure.

"I ſhould be exceedingly ſorry to be miſunderſtood; I ſhould be ſtill more ſo to miſlead any body; and therefore I beg it may be noticed, that I do not propoſe the extractum thebaicum, in this caſe, as an univerſal, infallible ſpecific; I know, from experience, that it is not; but as I alſo know, from repeated experience, that it will, under proper management and direction, do more than any, or than all other medicines; and that I have, by means of it, ſaved ſome lives, which, I am very ſure, would, under the common, and moſt approved method of treatment, without it, have been loſt, I could not anſwer to myſelf the not communicating what I had obſerved.

"If this was an experiment, in which the life or limb, or health of the patient, was in any degree endangered, or by which the perſon, on whom it may be tried, could, in any degree, be injured, I ſhould have withheld what I now publiſh, until a greater length of time, and more experience had rendered it ſtill more abſolutely certain; and I ſhould have thought myſelf ſtrictly vindicable in ſo doing: but as this is a medicine, whoſe general effects are well known, and which is, at the ſame time, ſo capable of direction and management, that it is almoſt impoſſible for any perſon who deſerves to be truſted with medicine at all to do any material harm with it, I thought it would be wrong and unjuſt to conceal what had occurred to me, leſt I might thereby deprive the afflicted of an aſſiſtance which, I verily believe, is not to be obtained from any other quarter.

"In ſhort, from what I have ſeen and done, I am perfectly convinced that, by its means, and by its means ſolely, I have ſaved lives which, without it, muſt have been loſt.

"If it preſerves a few of thoſe, who are ſo unfortunate as to labour under this naſty, painful, lingering, and deſtructive diſorder, to which we are all liable, and which has hitherto, moſt frequently, foiled all attempts of art, I ſhall be ſincerely glad to have contributed to ſo good an end: if it ſhould prove in other hands as ſucceſsful as it has with me, I ſhall be ſtill more ſo; but, on the other hand, if, after ſeveral times giving me reaſon to believe and hope that it would prove an inſtrument for the preſervation of many, it ſhould, upon more repeated trial, be found to fail, I ſhall be ſorry for the event, but ſhall ſtill think, that I did right in communicating what I had ſeen, and thereby endeavouring to be uſeful to mankind.

"Hoc opus, hoc ſtudium, parvi properemus et ampli,
Si patriæ volumus, ſi nobis vivere cari."

"If I am right in my conjecture concerning this hazardous and deſtructive malady; and if the method which I have propoſed and practiſed ſhould prove as ſucceſsful in the hands of others as it has in mine, I cannot help thinking, that the external or chirurgic treatment of the diſorder might be amended; that is, might be made to coincide more than it does at preſent with ſuch ſoothing kind of plan.

"Since I have had reaſon to embrace this opinion, and to act in conformity to it, I have found more advantage from frequently ſoaking the foot and ankle in warm milk, than from any ſpirituous, or aromatic fomentations whatever; that is, I have found the one more capable of alleviating the pain, which ſuch patients almoſt always feel, than the other; which circumſtance I regard as a very material one. Pain is always an evil, but, in this particular caſe, I look upon it as being ſingularly ſo. Whatever heats, irritates, ſtimulates, or gives uneaſineſs, appears to me always to increaſe the diſorder, and to add to the rapidity of its progreſs; and, on the contrary, I have always found, that whatever tended merely to calm, to appeaſe, and to relax, at leaſt retarded the miſchief, if it did do no more.

"The whole plan of the chirurgic treatment of this diſeaſe is founded on a general idea of warming, invigorating, ſtimulating, and reſiſting putrefaction; and the means generally made uſe of are very proper for ſuch purpoſe: but I muſt own that I think the purpoſe, or intention, to be improper.

"Upon this principle, the whole theriaca Londinenſis, and the preſent cataplaſma è Cymino, have been, and ſtill are, ſo freely uſed on this occaſion. A compoſition of this kind, if it does any thing, muſt heat and ſtimulate, and it is by heating and ſtimulating the ſkin, to which it is applied, that it ſo frequently does that miſchief which I am confident it often does, though ſuch miſchief is ſet to the account of the nature of the diſorder. Caſes exactly ſimilar, in all circumſtances, are not to be met with every day, but I am from experience convinced, that of two, as nearly ſimilar as may be, in point of pain, if the one be treated in the uſual manner, with a warm, ſtimulating cataplaſm, and the other only with a poultice made of the fine farina ſeminis lini, in boiling milk or water, mixed with ung. ſambuc. or freſh butter, that the pain, and the progreſs of the diſtemper, will be much greater and quicker in the former than in the latter.

"When the black or mortified ſpot has fairly made its appearance on one or more of the toes, it is the general practice to ſcarify or cut into ſuch altered part with the point of a knife or lancet. If this inciſion be made merely to learn whether the part be mortified or not, it is altogether unneceſſary, the detachment of the cuticle, and the colour of the ſkin, render that a decided point: if it be not made quite through the eſchar, it can ſerve no purpoſe at all; if it be made quite through, as there is no confined fluid to give diſcharge to, it can only ſerve to convey ſuch medicines as may be applied for the purpoſe of procuring digeſtion to parts capable of feeling their influence, and on this account they are ſuppoſed to be beneficial, and therefore right.

"When the upper part of the foot begins to part with its

its cuticle and to change colour, it is a practice with many to ſcarify immediately; here, as in the preceding inſtance, if the ſcarifications be too ſuperficial, they muſt be uſeleſs; if they be ſo deep as to cauſe a ſlight hemorrhage, and to reach the parts which have not yet loſt their ſenſibility, they muſt do what indeed they are generally intended to do, that is, give the medicines, which ſhall be applied, an opportunity of acting on ſuch parts.

"The medicines moſt frequently made uſe of for this purpoſe are, like the theriaca, choſen for this ſuppoſed activity; and conſiſt of the warm, pungent oils and balſams, whoſe actions muſt neceſſarily be to ſtimulate and irritate: from theſe qualities they moſt frequently excite pain, which, according to my idea of the diſeaſe, is diametrically oppoſite to the proper curative intention; and this I am convinced of from repeated experience.

"The dreſſings cannot conſiſt of materials which are too ſoft and lenient, nor are any ſcarifications neceſſary for their application. But I would go farther and ſay, that ſcarifications are not only uſeleſs, but, in my opinion, prejudicial, by exciting pain, the great and chiefly to be dreaded evil in this complaint. The poultice ſhould be alſo ſoft, ſmooth, and unirritating; its intention ſhould be merely to ſoften and relax; it ſhould comprehend the whole foot, ankle, and part of the leg; and ſhould always be ſo moiſt or greaſy as not to be likely to become at all dry or hard between one dreſſing and another.

"I will trouble the reader with only one remark more.

"When the toes are, to all appearance, perfectly mortified, and ſeem ſo looſe as to be capable of being eaſily taken away, it is in general thought right to remove them. However rotten and looſe they may ſeem to be, or really are, yet while they hold on they hold by ſomething which is ſtill endued with ſenſation, as may always be known, if they be bent back or twiſted with any degree of violence.

"I will not enter into a diſpute about the ſenſibility or inſenſibility of ligaments, nor undertake to determine whether they be ligaments or any other kind of parts, which ſtill maintain the connection of the toes with their own reſpective joints, or with the metatarſal bones; it is ſufficient for me to know, and to inform the young practitioner, that however looſe they may ſeem, yet if they be violently twiſted off, or the parts, by which they hang, be divided, a very conſiderable degree of pain will moſt commonly attend ſuch operation, which therefore had much better be avoided; and that I have ſeen this very pain, thus produced, bring on freſh miſchief, and that of the gangrenous kind.

"If the patient does well, theſe parts will certainly drop off; if he does not, no good can ariſe from removing them." Pott's Chirurgical Works.

Opium has been acknowledged by many other authors beſides Mr. Pott to be an exceedingly efficacious medicine in all caſes of gangrene accompanied with much irritation. Indeed, while bark is only proper in a limited number of inſtances, opium is indicated in all, either with a view of appeaſing pain, allaying irritation, procuring ſleep, or preventing diarrhœa.

Mr. Kirkland thought, that when opium is preſcribed, the medicine ſhould not be puſhed at firſt, as he believes more harm than good ariſes when the doſes are ſuch as to impair the appetite, occaſion affections of the heart, or delirium.

Camphor is a medicine not to be forgotten in caſes accompanied with irritation and debility. The celebrated Pouteau had a high opinion of its virtues in ſuch inſtances, and he uſed to order five grains to be taken with ten of nitre, every four hours.

Carbonic acid gas has alſo gained conſiderable repute for its beneficial effects in caſes of gangrene and ſphacelus. It has ſometimes done good when bark has failed. Water, impregnated with the gas, is a very eligible beverage for patients labouring under theſe complaints.

We have only to add, on the ſubject of the internal treatment of mortifications, that, in all theſe caſes, a good ſupply of freſh air and the ſtricteſt obſervance of cleanlineſs are of the higheſt importance to the health and recovery of the patient. A few particulars neceſſary to be ſtated concerning the treatment of mortifications from cold and preſſure, may very well be noticed in ſpeaking of the topical means.

Local treatment of Gangrene and Sphacelus.—There can be no doubt that the extent of the deſtruction about to take place in the parts during the gangrenous ſtage may always be conſiderably influenced by the kind of treatment purſued at this period of the diſorder. Hence, it behoves the practitioner, above all things, to find out, if poſſible, the cauſe of the miſchief, and, if he can, remove it as ſpeedily as poſſible. So, when the mortification appears to originate from violent inflammation, he muſt uſe every means in his power to remove this latter affection of the ſurrounding parts, which are ſtill alive, and on the point of being deſtroyed. The local treatment, like the conſtitutional, ought in theſe circumſtances to be of the antiphlogiſtic deſcription. It matters not what is applied to ſuch parts as are already dead; but it is of material conſequence that nothing irritating be put on thoſe which are living and in a high ſtate of inflammation. We ſhould be inclined on principle to make uſe of cold applications in preference to warm ones, and perhaps the lotio aquæ lithargyri acetati is as good as any other.

Mr. Hunter was of opinion that all the local applications ſhould be cold; but we know that there are practitioners who are averſe to this method, and provided they employ nothing ſtimulating, and only uſe moderately warm fomentations and emollient poultices, we cannot find much fault with them. It is a fact which cannot always be reconciled to theories, that in ſome caſes of inflammation the patient derives moſt relief from warm emollient applications; in others from cold ones.

When the ſurrounding inflammation is at an end, and the limits of the mortification are fixed, a ſoft linſeed poultice, containing ſome powdered charcoal, is an excellent application.

We have adviſed the ſurgeon to endeavour to diſcover the remote cauſe, and remove it if poſſible. When the diſorder is owing to preſſure of any kind, nothing avails without removing the occaſion of the ſloughing, and even ſuch removal may be too late to be of much ſervice. In this inſtance the chief means of preventing an increaſe of miſchief are to change the patient's poſture, and put cuſhions under him wherever they are likely to take the preſſure off the parts which are affected. In this ſort of caſe we have generally uſed a ſoft linſeed poultice or a ſimple pledget, as a topical application, though ſome ſurgeons prefer bits of lint dipped in ſpirit of wine.

Tight bandages ſometimes occaſion gangrene, and we need hardly ſay, that their removal is the very firſt indication.

Violent inflammation and gangrenous ſymptoms are ſometimes the conſequence of the expoſure of the parts affected to certain degrees of cold. Theſe evils are particularly apt to follow when the parts have been ſuddenly warmed. Experience has repeatedly evinced, that caloric ſhould always be communicated to frozen parts very gradually. Even when a part, which is not actually frozen, but exceſſively

cold, is all on a fudden placed in a very warm fituation, it is found that confiderable inflammation and floughing will frequently follow. The part becomes affected with fwelling, a livid difcolouration, and intolerable darting pain.

In order to reftore warmth to a part which is either in a frozen, or exceffively cold ftate, the fafeft plan is to rub it with fnow or very cold water, until figns of fenfe and motion return, when the frictions may be made with brandy, or camphorated fpirit of wine. The next object is to throw the patient into a perfpiration, which is to be fulfilled by adminiftering fome mulled wine, putting the patient to bed in a chamber where there is a fire, and covering him well with blankets. When the inflammatory and gangrenous fymptoms have already begun, in confequence of the part having been fuddenly warmed, the mifchief often admits of being ftopped by immerfing the part in water of a temperature nearly as low as the freezing point. This method fhould be perfifted in for a confiderable time.

When the effects of cold terminate in a fphacelus, the local treatment, as well as the general, is not attended with any particularity. An emollient poultice is commonly the beft application, until the floughs have been detached, when the fores fhould be dreffed, according to the principles to be explained in the articles ULCER and WOUNDS.

When a gangrene has proceeded to the ftate of fphacelus, fome practitioners are in the habit of applying the cataplafma cerevifiæ, or the cataplafma effervefcens. The firft is prepared by ftirring into the grounds of ftrong beer as much oatmeal as will make the mafs of a proper confiftence. The fecond is made by ftirring into an infufion of malt as much oatmeal as will render the mafs fufficiently thick, and then adding about a fpoonful of yeaft. The charcoal poultice we have already mentioned as a favourite application. Bark has alfo been topically ufed, from a fuppofition of its being a powerful antifeptic.

We may remark, however, that the linfeed poultice is made ufe of in moft inftances, and perhaps anfwers as well as any other in every cafe.

The ancients ufed to endeavour to ftop the fpreading of mortifications, by applying the actual cautery to the parts affected. This barbarous method was adopted in all ages, from the time of Hippocrates down to the beginning of the eighteenth century, when fcarifications and other plans had failed. "Illi affectus qui medicamentis non fanantur, ferro fanantur; qui ferro non fanantur, igne fanantur; qui igne non curantur, hos exiftimare oportet infanabiles." This memorable aphorifm, which Hippocrates left behind him, relating to the efficacy of fire, brought the cautery into ufe upon almoft every occafion. It was believed, as Mr. Sharp obferves, that in mortifications the putrefying principle, or venom, was extracted with the juices, which were dried up by the hot iron. It was alfo fancied, that the feparation of the floughs was exceedingly affifted by this procefs; and, what was more important, it was imagined, that the life of the part was quickened by drawing the fpirits to it, and freeing it of all humidities. Such was the language of the old furgeons.

It is well remarked by Mr. Sharp, that we have hardly in furgery a more extraordinary inftance of human fallibility than this; for, after an uninterrupted practice of above two thoufand years, this celebrated remedy, whofe virtues were fuppofed to be evident both from reafon and experience, is at length fallen into difrepute, and never employed for ftopping a gangrene. See Critical Enquiry, &c.

We have expreffed a general preference to emollient applications in cafes of mortification, and have alfo taken notice of the charcoal, fermenting, and oat-meal poultices, as fometimes being proper. We may likewife enumerate the carrot and cicuta poultices as having been occafionally thought ferviceable in cafes of gangrenous ulcers. Of the practice, however, of employing very ftimulating applications, we cannot refrain from declaring our decided difapprobation. It was with fome difguft that we read the directions of a modern writer and lecturer, when he fays, that "the furrounding parts may be invigorated by the application of alcohol, oil of turpentine—cataplafms containing theriaca Londinenfis, &c." This precept reminds us of the habit of a certain practitioner, who, whenever he had a patient with the facies Hippocratica, ufed to pour down the dying fellow's throat a glafs of brandy, by way of a final effort to fave him. However, to difmifs all anecdote from this ferious fubject, the practice of employing hot ftimulating applications in thefe cafes is one of thofe pernicious abfurdities into which our forefathers fell, and which, it feems, ftill continue to prejudice fome of our cotemporaries. It is only neceffary to add, with regard to topical ftimulants, in cafes of mortification, that to all furgeons who have imbibed the principles of their profeffion, under the able lecturers at the great hofpitals of this metropolis, our admonition not to imitate fuch practice will be needlefs.

The ancients knew, as well as the moderns, that it was of no confequence what they put on the floughs and mortified parts. Hence, when the mortification extended to any depth, they were always very anxious, that their invigorating, ftimulating, warm applications fhould extend their action to the fubjacent and furrounding living flefh. It was principally with this view that they ufed to make deep incifions and fcarifications in the fphacelated part. They alfo believed, that the practice was of ufe both in giving exit to collections of fanies under the floughs, and putting the living parts into a lefs ftrangulated condition. The old writers likewife advife us to cut to the quick, as the only means of making the blood and fpirits return to the place which they have abandoned.

We will not fay, that a furgeon can never have an opportunity of cutting through a flough, and letting out fome fanies, to the relief of his patient; but we will venture to declare, that the making of incifions and fcarifications is generally wrong and hurtful. If only the dead parts are touched, we confefs no harm can arife; but if the wound is carried down to the quick, pain, bleeding, and a renewal of the floughing, will be frequent confequences of fuch imprudent irritation. According to the principles which brought the practice into vogue, the incifions will anfwer no end, unlefs they extend through the dead parts, for they will not enable the applications to get to the quick, nor will they ferve to give exit to the fanies underneath. Now, unlefs it fo happens, that there is a large collection of matter under the flough, (which will not often happen,) the cutting inftrument will wound the living parts, excite great irritation, and often bring on ferious and fatal confequences. Wifeman, though an advocate for fcarifications, is candid enough to own, that he has feen the gangrene increafed, in confequence of the tendons being wounded. (See vol. ii. of his works.)

Since we place no confidence in the invigorating power of topical ftimulants, we have no occafion to take any meafures for extending their action to the living parts, and, confequently, do not fee the utility of fcarifications. We are not fo prejudiced, however, that we would not make a cut through a flough, if we were to fee that, by fo doing, we might ufefully difcharge any material quantity of confined fanious matter. At the fame time, we would ufe our utmoft caution not to injure the fubjacent living parts. As the principles which led to the common practice of fcarifications

are now exploded, it becomes unneceſſary to take up more of the reader's time in endeavouring to prove the bad effects of this proceeding.

When a ſphacelus has ceaſed to extend its limits, it will be ſome time before the ſurgeon can remove the ſlough, owing to the coheſion which ſtill ſubſiſts between the dead and living parts. The ſeparation, as we have already explained, is the work of nature, the proceſs being chiefly effected by the abſorbent veſſels, which take away the particles of matter, that form the bond of connection between the dead maſs and the living fleſh. It often happens, however, when a ſlough is large, that a portion of it will be looſe and fit for removal much ſooner than the reſt. In this circumſtance, it is proper to cut the looſe portion off, and take it away, for the ſake of cleanlineſs, and in order to diminiſh as much as poſſible the fetid effluvia in the room, which are highly detrimental to the patient's health. The ſame reaſons ſhould always make us vigilant to remove all the dead putrid matter as ſoon as it can be done without irritation or pain.

When the whole thickneſs of a limb is mortified, the patient might ſometimes get quite well by a natural proceſs; the ſloughs being thrown off, and the end of the remaining part of the limb healing up. Experience has proved, however, that when a ſphacelus has proceeded thus far, it is generally beſt to perform amputation "as ſoon as the mortification has evidently ſtopped, and a line of ſeparation can be diſcerned between the dead and living parts." The reaſons for the operation are, to give the patient a ſtump, with which he can uſe a wooden leg, and have the enjoyment of locomotion; to expedite his recovery; and to leſſen his ſufferings. Were amputation not executed, it would be a long while before all the ſloughs and exfoliations could come away; many inciſions would be neceſſary to extract all the pieces of dead bone, and open abſceſſes; and, after all the pain and confinement, the patient would not have a ſtump which could bear the leaſt preſſure, without becoming diſeaſed.

It will be noticed, that a particular ſtreſs is laid on the direction not to amputate before the mortification has ceaſed to ſpread. This rule is of the higheſt importance; for were the operation done ſooner, the ſtump would often become affected with gangrene, and the patient's death be accelerated.

When the old ſurgeons failed in their endeavours to ſtop a mortification, the famous maxim of "enſe recidendum," &c. was invariably followed, and, as Mr. Sharp remarks, the immediate proſpect of inevitable death, without this remedy, always prevented the leaſt doubt of its propriety; but (ſays this valuable writer) time has at length produced in this caſe a moſt remarkable revolution. The ſpreading of a gangrene, which was formerly eſteemed the ſtrongeſt motive for amputation, has now become an argument againſt it; and the moſt eminent ſurgeons always defer amputation till the gangrene has ſtopped, and ſometimes till the dead parts have advanced in their ſeparation.

The reaſon of this extraordinary change in practice is the amazingly ill ſucceſs which has attended the operation under the circumſtance of a ſpreading gangrene. Mr. Pott aſſures us, in his remarks on amputation, that he has often ſeen the experiment made of cutting off a limb in which gangrene had begun to ſhew itſelf, but never ſaw it ſucceed, and it invariably haſtened the patient's death. The cauſe of ſuch bad conſequences is imputed by authors to the impoſſibility of knowing how far the tendency to mortification reaches up the limb, and it is certain that ſuch diſpoſition frequently extends where there is no viſible alteration to excite the leaſt ſuſpicion. In many inſtances, a certain portion of the body ſeems deſtined to periſh, in ſpite of every proceeding on the part of the ſurgeon; and, ſhould he chance to amputate juſt below the unknown line, where the gangrene would ſpontaneouſly terminate, the ſtump itſelf muſt mortify. As there is never in any caſe any criterion by which we can judge where the gangrene will ſtop, it follows that we can never prudently determine where to amputate.

Generally ſpeaking, the operation ſhould be done when the mortification has ceaſed to ſpread, and a red line can be ſeen on the living edge, denoting the commencement of the ſeparation. However, there are inſtances in which the operation ſhould be poſtponed longer. We have ſeen in hoſpitals ſome patients with the ſubſtantial part of the lower portion of their leg in a ſphacelated ſtate, and the detachment complete, except with regard to the bones. Some of theſe patients were ſo reduced, that amputation, immediately performed, might have made them ſink under the hands of the operator. Neither was there now any urgency for the operation; the living ſurface was covered with healthy granulations, the diſcharge was moderate, and the dead maſs, being dry and covered with ſpirit of wine, which was not allowed to come into contact with the living fleſh, the fetid exhalation was not exceſſive. This grievance alſo can always be diminiſhed by taking care to let plenty of freſh air into the patient's chamber. We have ſeen ſome of theſe patients, after a ſhort time, and under a liberal allowance of wine, porter, and nouriſhing food, with bark, cordials, &c. regain a degree of ſtrength that was really ſurpriſing. The operation then admitted of being done under more advantageous circumſtances than at an earlier period. We entertain no doubt, that, in many of theſe inſtances, the patients would get quite well without amputation. The bones would exfoliate, and the extremity of the limb heal. But, we have before ſtated, that the cure in this way would be very tedious, and the ſtump unfit for bearing the leaſt preſſure, ſo that the motives for the operation are ſtill ſtrong and weighty.

Although we have explained that amputation cannot prudently be undertaken after a gangrene has begun, and while it is ſpreading, yet every practitioner ſhould know that the operation ought frequently to be performed before the mortification has had time to begin at all. There are many external injuries, ſuch as bad gun-ſhot wounds, lacerated wounds, ſhattered compound fractures, &c. which will inevitably bring on mortification, or which at leaſt will do ſo in nine caſes out of ten. In ſuch examples amputation ſhould be performed in the firſt inſtance, the wound of the operation being infinitely leſs dangerous than an extenſive ſphacelus.

GANGU, in *Geography*, a town of Africa, in Bambarra. N. lat. 13° 51'. W. long. 4°.

GANGUD, a town of Hindooſtan, in Guzerat; 35 miles S.S.W. of Amedabad.

GANGUE, in *Mining*, ſignifies the matrix of ores, or the matter ſurrounding the ore in a mineral vein: it is uſually ſpar of ſome kind, and is often called vein-ſtuff, or deads. See VEIN.

GANHEIM, in *Geography*, a town of Germany, in the principality of Wartzburg; ſix miles N.W. of Volckach.

GANI, *Diamond Mine of.* See DIAMOND.

GANJAM, a town of Hindooſtan, in the circar of Cicacole, near the bay of Bengal. It is ſituated on an eminence, near a river that is not navigable, about a mile within the bar. It has a pagoda, dedicated to an obſcene deity. N. lat. 19° 22. E. long. 85° 20'.

GANIL, in *Mineralogy*. This word, which in the Iriſh language

language purports lime-ſtone in the form of ſand, is applied by Mr. Kirwan to the third family of his firſt claſs of the calcareous genus. Its colour is deſcribed as yellowiſh white. Luſtre reflected only from a few ſhining particles. Tranſlucent on the edges. In the lump it cannot be broken but by a hammer; but ſmall pieces of it fritter between the fingers. Specific gravity 2.742. Phoſphoreſces when ſcraped with a knife in the dark. Contains 47 per cent. of carbonic gas, and is almoſt entirely ſoluble in nitrous acid.

It is found on the ſhores of Rhagbery, a ſmall iſland of the coaſt of Antrim. Mr. Kirwan mentions the neighbourhood of Veſuvius and mount Gothard as localities of the ſame foſſil; whence it is probably the ſame with that variety of granular lime-ſtone which has obtained the name of *Dolomite*. See Dolomite.

GANISTER, otherwiſe crowſtone or galliard, of which we have given an account under the article Crowstone, is a ſtone which, although it has the appearance of a fine-grained and very hard grit-ſtone, and is admirably adapted to the repairing of roads when broken ſufficiently ſmall, nevertheleſs contains ſo large a portion of alumine as to aſſimilate with the valuable fire-clay from whence it is dug, at Birkin-line in Aſhover, Crook's-moor in Sheffield, and other places in and near Derbyſhire; and it has recently been applied, when pounded very fine and kneaded with water, to make (without the addition of clay or other ſubſtances) the beſt crucibles for the Sheffield ſteel-makers' uſe of any which they have been able hitherto to procure. This fact is not merely intereſting to the metallurgiſt, and thoſe who want veſſels to ſtand very intenſe degrees of heat, but has alſo ſome geological importance, in further generalizing the fact, diſcovered by Mr. Farey in his recent examination of about 500 collieries in and around Derbyſhire (ſee Philoſophical Magazine, vol. xxxv. p. 421), mentioned under our article Floor *of Coals*: crowſtone or ganiſter being the only durable ſtone or rock on which a ſeam of coals immediately reſts, in all this extenſive diſtrict, or in any other collieries which have fallen under that gentleman's obſervation, or been the ſubject of his inquiries; ſince it now appears, that even this hard and durable ſtone, when mechanically reduced to a plaſtic ſtate, ſuch as all the clunches and other hard floors or hills of coal ſoon acquire by expoſure to the air and rain, has the ſame properties of an infuſible fire-clay which diſtinguiſh the floors of coal-ſeams, perhaps in this and every other part of the world.

GANKA, in *Geography*, a town of Arabia, in the province of Oman; 124 miles S. of Maſcate.

GANKU, a town of China, of the third rank, in the province of Se-tchuen; 12 miles W. of Ho.

GAN-NAN, a town of China, of the third rank, in Koei-tcheou; 35 miles E. of Pou-ngan.

GANNAT, a town of France, and principal place of a diſtrict, in the department of the Allier; 27 miles S. of Moulins. The place contains 5043, and the canton 12,521 inhabitants, on a territory of 192½ kiliometres, in 12 communes. N. lat. 46° 6'. E. long. 3° 16'.

GANNELOR, a ſmall iſland in the gulf of St. Laurence, in N. lat. 48°, near Bird iſland.

GANNEMIE, a town of Arabia, 28 miles N.W. of Dsjebi.

GANNET, in *Ornithology*. See Pelecanus *Baſſanus*.

Gannet *Iſland*, in *Geography*, a ſmall iſland near the north coaſt of New Zealand, in the ſouth Pacific ocean, ſo called from the number of gannets that were ſeen to fly about it. S. lat. 37° 57'. W. long. 184° 46'.

GANNING, a town of China, of the ſecond rank, in Yun-nan. N. lat. 25°. E. long. 102° 16'.

GANOR, a town of Hindooſtan; 40 miles N.N.W. of Delhi.

GANOS, a town of European Turkey, in Romania, on the ſea of Marmora; 32 miles N. E. of Gallipoli. N. lat. 40° 48'. E. long. 27° 13'.

GAN-PIN, a town of China, of the third rank, in Koeitcheou; 20 miles N.E. of Ngan-chun.

GAN-PING, a town of China, of the third rank, in Petche-li; 12 miles N. of Ching.

GANSIGNI, a town of Hindooſtan, in the circar of Aurungabad; 32 miles E.S.E. of Aurungabad.

GANT, a town of Germany, in the Tyroleſe; ſeven miles W.N.W. of Landeck.

GANTINGA, a town on the eaſt coaſt of the iſland of Celebes. N. lat. 0° 14'. E. long. 122° 6'.

GANTLET, or Gauntlet, a large, ſtrong glove, made to cover the arm, or hand, of a cavalier, armed at all points.

The word is derived of the French *gantelet;* and that from *gand, gant, glove.*

The gauntlet was of iron, and the fingers plated. The caſk and gauntlets were always borne in the ancient marches in ceremony. Gauntlets were not introduced till about the thirteenth century.

The gantlet was frequently thrown, like the glove, by way of challenge.

Gantlet, in *Surgery*, is a kind of bandage for the hand, being a ſwathe, four or five yards long, wherewith they wrap up the hand, and all the fingers, one after another.

GANTLOPE, a military puniſhment. See *Military* Execution.

Gantlope, or *Gauntlope*, vulgarly pronounced *gauntlet*, is a puniſhment for felony, or ſome other heinous offence, in a ſhip of war. For this purpoſe, the whole ſhip's crew is diſpoſed in two rows, ſtanding face to face on both ſides of the deck, ſo as to form a lane, whereby to go forward on one ſide, and return aft on the other; each perſon being furniſhed with a ſmall twiſted cord, called a knittle, having two or three knots upon it. The delinquent is then ſtripped naked above the waiſt, and ordered to paſs forward between the two rows of men, and aft on the other ſide, a certain number of times, rarely exceeding three; during which every perſon gives him a ſtripe as he runs along. This puniſhment, which is called "running the gauntlet," is ſeldom inflicted, except for ſuch crimes as will naturally excite a general antipathy among the ſeamen.

GANUARA, in *Geography*, a town of Hindooſtan, in Golconda; 10 miles N. of Hydrabad.

GAN-YE, a town of China, of the third rank, in Setchuen; 10 miles W. of Ho.

GANYMEDE, Γανυμηδης, a term lately come in uſe to expreſs a catamite, or bardacio. See Sodomy.

The expreſſion takes its riſe from a young beautiful Trojan ſhepherd, thus called, whom Jupiter raviſhed, or carried off, by his eagle, or rather by himſelf, under the figure of an eagle, as he was hunting upon mount Ida; and made him his cup-bearer, in the place of Hebe; who, having made a falſe ſtep, and ſpilt her liquor, was turned out of that office.

Some ſay, that the Jupiter who raviſhed Ganymede was Tantalus, king of Phrygia; the eagle expreſſed the ſwiftneſs wherewith he was carried off.

The ſtatue of Ganymede was tranſported from Greece to Rome, and ſet up in the temple of Peace; and to this Juvenal refers, when he ſays,

"Nuper enim repeto fanum Iſidis, et Ganymedem hic facis."

GAOGA, in *Geography*, a country of Africa, W. of Nubia, with a town of the fame name, fituated on a large lake. The inhabitants are faid to be barbarous and uncivilized. N. lat. 16°. E. long. 26°.

GAOL, a prifon, or place of legal confinement.

The word is formed of the French *geole*; and that of the barbarous Latin *geola, gaola, gayola*, a *cage*; whence the Picards ftill call a bird-cage *gayolle*. The gaoler, geolier, was called *gaularius* and *cajularius*. Scaliger derives the word *gaoler* from *janicularius*. And fome Latin authors call him *commentarienfis*, becaufe he keeps a regifter, or lift, of all thofe under his cuftody.

Every county hath two gaols; one for debtors, which may be any houfe where the fheriff pleafes; the other for the peace and matters of the crown, which is the county gaol.

By 22 and 23 C. II. c. 20. the gaoler fhall keep debtors and felons feparate, on pain of forfeiting his office, and treble damages to the party grieved; and by 31 G. III. c. 46. tranfports are to be kept feparate from other prifoners. As the gaol is intended, in moft cafes, for cuftody, and not for punifhment, it is enacted by 14 Geo. III. c. 59. that the juftices, in their feveral quarter feffions, fhall order the walls and ceilings of the feveral cells and wards, both of the debtors and felons, and of any other rooms ufed by the prifoners in their refpective gaols, where felons are ufually confined, to be fcraped and whitewafhed once in the year at leaft, and to be regularly wafhed and kept clean, and conftantly fupplied with frefh air by hand ventilators or otherwife; and fhall order two rooms in each gaol, one for the men and another for the women, to be fet apart for fick prifoners; and order a warm and cold bath, or commodious bathing-tub, to be provided in each gaol, and direct the prifoners to be wafhed in fuch warm or cold baths, or bathing-tubs, &c.; and they fhall appoint an experienced furgeon or apothecary, at a ftated falary, to attend the gaol, and to report, at each quarter feffions, the ftate of the health of the prifoners; order clothes for the prifoners when they fee occafion, prevent their being kept under ground when it can be done conveniently, and from time to time make orders for reftoring or preferving the health of the prifoners; the expences to be paid out of the county rates, or out of the public ftock of any city, franchife, or place to which the gaols belong. The gaoler is fubject to fine for neglect or difobedience of the orders of juftices, by complaint to the judges of affize, or to the juftices in their quarter feffions. By 31 G. III. c. 46. vifiting juftices are appointed for infpecting gaols at leaft three times in each quarter of a year, in order to prevent abufes, &c., and they are to report to the quarter feffions. The juftices in feffions may alfo appoint clergymen to officiate in gaols according to the rites of the church of England, and allow to each a falary not exceeding 50*l*. a year, to be paid by the treafurer of the county-rate. 13 G. III. c. 58.

If a gaol be out of repair, infufficient, &c. the juftices of the peace in the quarter-feffions may agree with workmen for rebuilding or repairing it; and by warrant under their hands and feals, order the fum agreed upon to be levied upon the feveral hundreds and divifions in the county, by a proportionate rate; and the juftices in feffions may borrow, on mortgage of the faid rates, any fum not lefs than 50*l*. nor more than 100*l*. and difcharge the whole by yearly payments. 11 and 12 W. III. cap. 19. 24 Geo. III. c. 54. See PRISON-*breaking*.

GAOL *Delivery*. See JUSTICES, and OYER and *Terminer*.

GAOL *Fever*. See FEVER, and TYPHUS.

GAOLER, is the mafter of a prifon; one that hath the cuftody of the place where prifoners are kept. Sheriffs muft make fuch perfons gaolers for whom they will anfwer: but if there is a default in the gaoler, action lies againft him for an efcape, &c. (2 Inft. 592. 14 Ed. III. ft. 1. c. 10. 19 H. VII. c. 10.) In common cafes the fheriff or gaoler is chargeable, at the difcretion of the party; though the fheriff is moft ufually charged. (Wood's Inft. 76.) When a fheriff quits his office, the cuftody of the county gaol can belong only to his fucceffor. 1 L. Raym. 136.

By 8 and 9 W. III. cap. 27. marfhal and warden taking any reward to connive at prifoners' efcape, forfeits 500*l*. and his faid office, and is for ever after incapable of holding fuch office. The office of marfhal of the king's bench, and warden of the Fleet, fhall be executed by thofe who have the inheritance of the faid prifons, or their deputies, &c. By 3 Geo. I. cap. 15. no one fhall purchafe the office of gaoler, or any other office pertaining to the high fheriff, under pain of 500*l*.

Where a gaol is broken by thieves, the gaoler is anfwerable; not if it be broken by enemies. (3 Inft. 52.) If a criminal, endeavouring to break the gaol, affaults his gaoler, he may be lawfully killed by him in the affray. (1 Hawk. 71. 1 H. H. 496.) But if the gaoler or his officers, or any perfon aiding him, fhould fall in the conflict, this will amount to wilful murder in all perfons joining in fuch refiftance. (Foft. 321.) By 24 G. II. cap. 40. no licence fhall be granted for felling fpirituous liquors within any gaol or prifon; and if the gaoler fhall fell, lend, ufe, or give away, or fuffer the fame, except by way of medicine, he fhall forfeit 100*l*. half to the king, and half, with full cofts, to him who fhall fue. Any perfon bringing any fpirituous liquors into fuch gaol, may be apprehended by the gaoler or his fervants, and carried before a juftice; and upon conviction by the oath of one witnefs or otherwife, fhall be committed to prifon or the houfe of correction for a term not exceeding three months, unlefs he fhall immediately pay a fine not exceeding 20*l*. nor lefs than 10*l*. at the pleafure of the juftice, half to the informer, and half to the poor of fuch gaol. A copy of thefe claufes fhall be hung up in each gaol, on pain of the gaoler forfeiting 40*l*. A gaoler fhall not fuffer tippling or gaming in fuch prifon, nor be licenfed to fell any wine, ale, or other liquors; nor have any beneficial intereft or concern in the fale of any liquors, or in any tap-houfe, tap-room, or tap, on pain of forfeiting 10*l*. for every fuch offence. The juftices in their feffions may appoint falaries to gaolers in lieu of the profits derived from the fale of liquors; to be paid out of the county rate. By 14 Eliz. c. 5. and 12 C. II. c. 29. prifoners are to be provided for by a fum to be paid out of the county rate. (See alfo 31 G. III. c. 46.) By this ftatute it is enacted, that the juftices in feffions, or fpecial adjournment thereof, fhall regulate and fettle a table of fees and rates to be taken by gaolers; and fhall order a copy of the fame to be hung up in the court of affize and quarter feffions, and another copy to be fent to the gaoler, who fhall caufe the fame to be hung up in fome confpicuous place within the gaol; and all orders and directions contained in the act of 32 G. II. c. 28. refpecting the table of fees to be taken by gaolers, fhall be conformed to as if the fame were in this act particularly enacted and repeated. By the fame ftatute, the keeper of every gaol fhall on the firft day of every affize make a return in writing to the clerk of affize or other proper officer, and fhall fpecify therein the number and fize of the cells, the names of the prifoners, the offences of which they have been guilty, the court before which every perfon was convicted, the fentence of the court, if tried and convicted before any court of record, or if committed by a juftice of the peace, the name of fuch juftice, and the offence of which

which he was convicted, the age, bodily state, and behaviour of every such convict; such return, before it is delivered into court, to be examined and signed by one of the visiting justices. A gaoler voluntarily suffering prisoners to escape shall be punished in the same manner as the prisoner ought to have been who escaped; and if he negligently permit him to escape, he shall be punished by fine and imprisonment; and the sheriff shall answer for him. 2 Hawk. 134, 5, 6. 5 Mod. 415, 416.

The abuses of gaolers and sheriffs' officers towards the unfortunate persons in their custody, are well restrained and guarded against by statute 32 Geo. II. cap. 28.

Gaolers are not justified by law in fettering a prisoner unless he is unruly, or has attempted an escape. (2 Inst. 381. 3 Inst. 34.) The humane language of our ancient lawgivers is; "Custodes pœnam sibi commissorum non augeant, nec eos torqueant; sed omni sævitia remota, pietateque adhibita judicia debite exequantur." Flet. lib. i. cap. 26. If the gaoler keep the prisoner more strictly than he ought of right, whereof the prisoner dieth, this is felony in the gaoler by the common law; and hence it is, that if a prisoner die in a gaol, the coroner ought to sit upon him; and if the death was owing to cruel and oppressive usage on the part of the gaoler, or any officer of his, it will be deemed wilful murder in the person guilty of such duress. 3 Inst. 91. Fost. 321, 2.

GAONS, a certain order of Jewish doctors, who appeared in the East after the closing of the Talmud. The word gaons signifies *excellent, sublime*; as in the divinity schools we formerly had irrefragable, sublime, resolute, angelic, and subtile doctors. The Gaons succeeded the Seburæans, or Opiners, about the beginning of the sixth century. Chanan Meischtia was the head, and the first of the excellents; he restored the academy of Pandebita, which had been shut up for the space of thirty years.

GAP, in *Rural Economy*, a defect, breach, or opening in a hedge fence. These sorts of gaps are capable of being repaired in many different ways, according to their nature and circumstances; but it is in general the best done by having recourse to living plants of the same kind as the hedge, and suited in size to it. See FENCE.

GAP, in *Geography*, a town of France, principal place of a district, and capital of the department of the Higher Alps. The place contains 8050, and the canton 10,893 inhabitants, on a territory of 200 kiliometres in 7 communes. Before the revolution, it was the see of a bishop, suffragan of Aix, and capital of a county called "Gapençois," about nine leagues long and six wide; 45 miles S. of Grenoble. N. lat. 44° 34'. E. long. 6° 10'.

GAPSAL, or HAPSAL, a town of Russia, in the government of Revel, on a small gulf of the Baltic; formerly the see of a bishop, and subject to the Danes, but in the beginning of the 18th century annexed to Russia, 36 miles W.S.W. of Revel. N. lat. 59° 5'. E. long. 42° 24'.

GARA, a lake of Ireland, in the county of Sligo, on the confines of Roscommon. It is an extensive and romantic sheet of water, not far from the town of Boyle.

GARA, a lake of Egypt; 12 miles S. of Fayoum.

GARACHIO, a town on the west coast of the isle of Teneriffe.

GARAFOA, CAPE, a cape on the west coast of Africa. N. lat. 2° 40'.

GARAGAY, in *Ornithology*, the name of a rapacious bird of Mexico, of the size of our kite; its head and the tips of its wings are white; it makes but short flights; it is very fond of the eggs of tortoises and crocodiles, and hunts the places where they have buried them in the sands.

GARAJAM, in *Geography*, a river of Africa, which runs into the Atlantic, N. lat. 3°.

GARAMA, in *Ancient Geography*, a town of Africa, the metropolis of the people called *Garamantes*.

GARAMANTES, the ancient inhabitants of an extensive district of Africa, situated to the S. E. of Gætulia, and E. of the Nigritæ. Although the limits of their country cannot be precisely ascertained, there is reason to believe, that it extended to the borders of the Proper Ethiopia, and that it comprehended many large territories. According to Dr. Shaw, some of the ancient Garamantes spread themselves over that tract that included the districts of Gad-demz, Fezzan, and some of the more distant cities and villages of the kingdom of Tripoli. Their country, whatever might be its extent, abounded with wild beasts; and the inhabitants were so savage, that they fled at the sight of a person belonging to any other nation. Destitute of arms, they made no effort for self-defence, when they were attacked, and they wholly secluded themselves from intercourse with other people. They seem, however, to have gradually advanced to a higher state of society, as they built towns, or rather dashkras; the principal of which were Garama, near mount Girgiris, and the source of the Cinyphus, Debris, and Metelgæ. They also associated with a neighbouring people, called the Marmaridæ, and carried on trade with the Carthaginians, Arabs, Persians, and Ethiopians. Indeed, the caravans of the Carthaginians must, in all probability, have passed to Carthage from those remote countries, through the sandy deserts of the Garamantes: and it has been said that they, as well as the Persians and Ethiopians, supplied the Carthaginians with a great number of valuable gems. Although it appears, by the testimony of Herodotus, that the ancient Garamantes were reproached with cowardice, their posterity seem to have been of a different disposition, if we may rely on the accounts given of them by Pliny, Tacitus, and Festus Avienus. Some of them roved about the deserts of Libya like their successors the modern Bedoweens; whilst others inhabited the dashkras which were dispersed over those parched and barren plains. The former lived frugally, and supported themselves by hunting. The country of the Garamantes, as well as Nigritia, was probably first peopled from Egypt and Ethiopia; and they seem to have been the descendants of Misraim and Cush, intermixed with some colonies of Arabs. The language, or rather languages, spoken in these regions, bore a great affinity at first to the Egyptian, Arabic, and Ethiopic, and at this time may possibly be corrupted dialects of these tongues. As to their religion, they, in common with the Arabs, Indians, and Ethiopians, worshipped Jupiter Ammon, representing him with a ram's head, or at least with ram's horns, and had a temple dedicated to him. The women among the Garamantes were used promiscuously, so that they seem to have had no notion of matrimony. In early times they were governed by phylarchs, or heads of tribes, like the Gætulians and Arabs; but in process of time, as we learn from Tacitus, monarchy seems to have prevailed among them. Ptolemy indeed asserts, that they formed a large and powerful nation, extending themselves from mount Usargala to the lake or morass Nuba; and yet their affairs are scarcely at all recorded in history. Masinissa, when expelled from his dominions by Syphax, took refuge among them. As the roads to their country from Mauritania were rendered impassable by robbers, the Romans had little knowledge of them till after the expiration of the republic. Lucius Cornelius Balba entirely subdued them, and for this service Augustus granted to him a triumph. Afterwards they seized an opportunity of emancipating themselves from the Roman yoke, as Florus informs us; and we learn from Tacitus, that the

king of the Garamantes joined Tacfarinas, in the reign of Tiberius, againſt the Romans. After the laſt defeat and death of Tacfarinas, they ſent ambaſſadors to Rome to appeaſe the reſentment of Tiberius; which was effected, moſt probably, by their entire ſubmiſſion; ſince it appears probable, that the Roman empire extended on that ſide almoſt, if not altogether, to the northern coaſt of the Niger.

GARAN, in *Geography*, a ſmall iſland in the North ſea, near the N. coaſt of Scotland; 3 miles E. S. E. of cape Wrath. N. lat. 58° 35'. W. long. 4° 45'.

GARAN, a town of Candahar, 12 miles from Cabul.

GARAPHAS, in *Ancient Geography*, a maritime town of Africa Propria, according to Ptolemy.

GARAPHI MONS, a mountain of Mauritania Cæſarienſis, to the north of the river Chinalaph. It was S. of Julia Cæſarea, and S. W. of Tipaſa.

GARAPO, CAPE, a cape of France, in the Mediterranean, about 6 miles S. of Antibes. N. lat. 43° 31'. E. long. 7° 4'.

GARATIVA, a river of Braſil, which runs into the Atlantic, S. lat. 13°.

GARATRONIUM, in *Natural Hiſtory*, the name of a foſſile body, commonly ſuppoſed the ſame with the bufonites, but very improperly; the only juſt account of it is that of Ferrante Imperato, who tells us that it is a purple ſtone with variegations of a gold yellow, diſpoſed in the manner of the veins of many ſorts of marble; and that the Perſians, and many of the eaſtern people, put it into the handles of their ſabres. It appears by this deſcription to be a kind of jaſper; and is very improperly confounded with the bufonites, a ſmall ſtone fit only to be worn in rings.

GARAY, in *Geography*, a town of Africa, in the kingdom of Cayor, 80 miles S. E. of Amboul.

GARAZA, a town of Braſil, in the province of Pernambuco, 25 miles N. of Olinda.

GARB, in *Britiſh Antiquity*, from the French *garbe, faſcia*, a bundle or ſheaf of corn. See GARBE.

GARB, or *El-Garb*, in *Geography*, a province of Morocco, which begins in the territory of Tetuan, and extends near a degree in length from eaſt to weſt, reaching quite to cape Spartel: its length from north to ſouth is about 36 leagues. It is bounded to the north by the ſtraits of Gibraltar, to the ſouth by the river Mamora, to the weſt by the ocean, and to the eaſt by the kingdom of Fez. The northern part is not very fruitful; as it is interſected with vallies, the lands are liable to be injured by the heavy rains, and the harveſt is very uncertain; the reſt of the province is extremely beautiful; it is watered by ſeveral rivers, and embelliſhed by ſome foreſts.

GARBAN, a town of Candahar, on the Behat; 30 miles N. of Cabul.

GARBE, in *Heraldry*, a repreſentation of a ſheaf of corn, or other grain; ſometimes borne in coat-armour, to ſignify ſummer, or the month of Auguſt; as the bunch of grapes denotes autumn.

GARBE *Dendour*, in *Geography*, a town of Nubia, on the weſt coaſt of the Nile, in which is an ancient temple. The Nile near this place is of moſt difficult navigation; the whole breadth being filled up with rocks under water, and between the rocks with eddies and whirlpools; 60 miles S. of Syene.

GARBE *Dirſche*, a town of Nubia, on the eaſt coaſt of the Nile, in which are ſome ancient ruins; three miles N. of Garbe Dendour.

GARBIA, a diſtrict in the north part of Egypt, between the eaſt and weſt branches of the Nile.

GARBLER *of Spices*, an officer of great antiquity in the city of London, who is empowered to enter any ſhop, warehouſe, &c. to view and ſearch drugs, &c. and to garble and cleanſe them. By ſtat. 6 Ann. c. 16. this officer is to be appointed by the court of lord mayor, aldermen, and common council, to garble ſpices at the requeſt of the owner, but not otherwiſe.

GARBLES, the duſt, ſoil, or filth, ſevered from good ſpice, drugs, &c.

GARBLING of ſpices, drugs, &c. is the cleanſing it from the droſs and duſt, mixed therewith, and ſevering the good from the bad.

The word comes from the Italian *garbellare, to ſhake.*

GARBLING *of bow-ſtaves*, is the ſorting or culling out the good from the bad.

GARBO, IL, in *Geography*, a town of Etruria; ſix miles E. S. E. of Leghorn.

GARBOARD-STRAKE, in a *Ship*, is the firſt ſeam next to the keel.

GARBOARD-*plank*, the firſt plank faſtened on the keel.

GARCHANSKOI, in *Geography*, a town of Ruſſia, in the government of Tobolſk, on the river Tobol; 80 miles S. of Tobolſk.

GARCIA, a town of Spain, in the province of Catalonia; 18 miles N. of Tortoſa.

GARCIAS-LASSO, or GARCILASO, DE LA VEGA, in *Biography*, an eminent Spaniſh poet, was born at Toledo in 1503. He was the younger ſon of a man of rank, who had been employed in ſome important negociations. Garcilaſo, as a man, was diſtinguiſhed for his wit and bravery, and as a poet, he adopted the ſtyle and manner of his friend Boſcan (ſee his article). His works conſiſt chiefly of paſtorals, ſome of which are very prolix, and in one of them, it is ſaid, he has introduced almoſt action enough for a drama. His principal excellence is tenderneſs, which is frequently diſplayed with great beauty in his ſonnets, of which the reader will be pleaſed with the following ſpecimen tranſlated by Mr. Southey.

"As when a mother, weak in tenderneſs,
Hears her ſick child with prayers and tears implore
Some ſeeming good, that makes his pain the leſs,
Yet, with ſhort eaſe! the future evil more:
Even as her fondneſs yields to his vain will
She haſtes to gratify her ſickly ſon—
Anticipating then the coming ill,
Sadly ſhe ſits, and weeps what ſhe has done.
Thus have I pampered my diſtemper'd mind,
And yielded thus to fancy's wayward mood,
Poor dupe of fancy! ſelf-condemned to find
The future anguiſh in the preſent good.
Thus do I waſte a wretched life away,
And nightly weep the errors of the day."

"Both Boſcan and Garcilaſo poſſeſſed more learning than taſte, and more taſte than genius. Their poems, particularly thoſe of the latter, are full of imitations from the ancients." The poems of Garcilaſo have paſſed through many editions, and commentaries have been written upon them by Sanchez de las Brozas, the moſt eminent of the Spaniſh grammarians. Garcilaſo followed the profeſſion of arms, and attended Charles V. in many of his expeditions. At length he loſt his life in battle, as he was ſignalizing his courage in the preſence of his ſovereign, in an attack on a fortreſs in Provence, in the year 1536. Monthly Mag. Gen. Biog. Moreri.

GARCINIA, in *Botany*, named by Linnæus in commemoration of Laurence Garçin, M. D. F. R. S who lived in the early part of the laſt century, and viſited the Eaſt,

Eaſt, where he made ſeveral botanical obſervations, ſome of which are printed in the Philoſophical Tranſactions n. 415, 431, 489, 491. In the place laſt mentioned he eſtabliſhes the genus *Salvadora*, and in n. 431 deſcribes the valuable tree now under conſideration, by its Malay name, *Mangoſtans*. Linn. Gen. 237. Schreb. 319, 831. Willd. Sp. Pl. v. 2. 848. Mart. Mill. Dict. v. 2. Juſſ. 256. Lamarck Illuſtr. t. 405. (Mangoſtana; Gærtn. v. 2. 105. t. 105. Cambogia; Linn. Gen. 263. Schreb. 351. Juſſ. 256.)—Claſs and order, *Dodecandria Monogynia*. Nat. Ord. *Guttiferæ*, Juſſ.

Gen. Ch. *Cal.* Perianth inferior, of four roundiſh, concave, obtuſe, ſpreading, permanent leaves. *Cor.* Petals four, roundiſh, concave, ſpreading, rather larger than the calyx. *Stam.* Filaments about 16, erect, collected into a tubular form, ſimple, ſhorter than the calyx; anthers roundiſh. *Piſt.* Germen ſuperior, nearly oval; ſtyle ſcarcely any; ſtigma flat, peltate, ſpreading, in ſix or eight blunt lobes, permanent. *Peric.* Berry coriaceous, globoſe, large, crowned with the ſtigma, of ſix or eight pulpy cells, with membranous partitions. *Seeds* ſolitary, imbedded in the pulp, vertical, ſomewhat elliptical, compreſſed, rugged, with a ſimple embryo.

Eſſ. Ch. Calyx inferior, of four leaves. Petals four. Berry coriaceous, of ſeveral cells, crowned with the ſtigma. Seeds ſolitary.

Obſ. The number of the ſtamens, and of the ſegments of the ſtigma, the latter always agreeing with the number of cells in the fruit, differ in different ſpecies from four to eight, and vary in the ſame from five to eight, according to the obſervations of Gærtner and Juſſieu. The former firſt united *Cambogia* to *Garcinia*, but is highly reprehenſible for the troubleſome and improper change of the Linnæan name to a barbarous one that agrees with only one ſpecies.

1. G. *Mangoſtana*. Linn. Sp. Pl. 635. (Mangoſtana; Rumph. Amboin. v. 1. 132. t. 43. Mangoſtan Apple.)—Branches quadrangular. Leaves ovate; their veins ſomewhat diſtant. Flowers terminal, ſolitary.—Native of the more oriental parts of the Eaſt Indies, as Malacca, Sumatra, and Java. Cultivated with difficulty in ſome few places beſides. *Rumphius*. This is univerſally allowed to be the moſt delicious, as well as moſt wholeſome, of Indian fruits. It reſembles a ſmall orange, of a dark brown colour, full of ſoft ſweet pale-coloured pulp, from which the outer coat eaſily ſeparates, and each of whoſe cells contains a large oval ſeed. The external coat dried is aſtringent, and uſeful in dyſenteries. The pulp may be eaten with ſafety, and in almoſt any quantity, in health or in ſickneſs. Rumphius ſays, it is eſteemed a very bad ſymptom if a patient has no appetite even for the Mangoſtan The *tree* is about the ſize of a common apple-tree, ſmooth in all its parts, with oppoſite quadrangular branches. *Leaves* oppoſite, five or ſix inches long, ovate, pointed, of a ſhining green, entire, furniſhed with a rather ſlender midrib, from which ſpring irregularly numerous rather diſtant veins. *Foot-ſtalks* three quarters of an inch long, thick. *Flower-ſtalks* terminal, ſimple and ſingle-flowered, an inch long, without bracteas. *Flowers* whitiſh, the ſize of a ſhilling, with yellow ſtamens. The *fruit* ripens uſually in November and December. Mr. Ellis, who was very deſirous of procuring this plant, publiſhed in 1775 a deſcription of it and the bread-fruit, with "directions to voyagers for bringing over theſe and other vegetable productions." There is however little hope of our ever ſeeing the Mangoſtan growing in Europe.

2. G. *celebica*. Linn. Sp. Pl. 635. (Mangoſtana celebica; Rumph. Amboin. v. 1. 134. t. 44.)—Branches roundiſh. Leaves elliptic-oblong; their veins numerous, cloſe, ſtraight and parallel.—Native of the iſland of Celebes, from whence, according to Rumphius, it was brought to Amboyna. We have ſpecimens from the latter place, under the name of Wild Mangoſtan, gathered by the late Mr. Chriſtopher Smith. It appears to differ from the firſt ſpecies in having rounder, or at leaſt not regularly quadrangular, *branches*; more elliptical *leaves*, tapering to each end, whoſe veins are peculiarly numerous, ſtraight and parallel. *Footſtalks* half an inch long, keeled and very deeply channelled. *Flowers* dirty white, fragrant, terminal, about three together, on ſhort thick ſtalks. *Fruit* like the former, but yellower and more acid. Rumphius reports that ſmall pieces of the wood, buried for three years in marſhy rice-grounds, become petrified, and make a ſort of hone, called Kiras-ſtone, after the country name of the tree. The ſame author ſuſpects the Panitsjika, or Lymappel, Rheede Hort. Malab. v. 3. 45. t. 41, to be this ſame plant; but that is unqueſtionably Roxburgh's *Embryopteris glutinifera*. See Embryopteris.

3. G. *Cambogia*. Willd. Sp. Pl. v. 2. 848. (Mangoſtana Cambogia; Gærtn. v. 2. 106. Cambogia Gutta; Linn. Sp. Pl. 728. Coddam-pulli; Rheed. Hort. Mal. v. 1. 41. t. 24. Carcapuli; Cluſ. Exot. 286.—Leaves elliptical, acute at each end; their veins rather diſtant. Fruit furrowed. Branches round.—Native of denſe woods, where the ſoil is ſandy, in Malabar. *Rheede*. This is deſcribed as a tall *tree*, with a trunk about four feet in diameter, and a thick widely ſpreading *root*, out of which, when wounded, flows a very viſcid but taſteleſs liquor. The *branches* are round and ſmooth. *Leaves* oppoſite, three or four inches long, elliptical, entire, tapering at each extremity, a little oblique, ſmooth, paler beneath; their lateral veins rather few and diſtant, forming very acute angles with the midrib, connected by reticulations. *Footſtalks* ſlightly channelled. Rheede deſcribes the *flowers* as terminating the young leafy ſhoots, on very ſhort ſtalks, and of a fleſh or roſe-colour, without ſmell. His minute account of their ſtructure well accords with our generic character. The *fruit* is pendulous, on ſtalks an inch long, ſolitary, the ſize of a ſmall orange, but furrowed like a melon, and crowned with tumid crenate remains of the ſtigma; its colour yellow or whitiſh; the flavour of its pulp ſweet with ſome acidity. The cells and ſeeds are ſaid to be 8, 9 or 10. The ſeaſon of flowering and fruiting is March. In a ſpecimen of this tree, ſent by the Rev. Dr. Rottler from the Eaſt Indies, the flower-ſtalks, which are clothed with ruſty down, and near an inch long, grow in pairs from buds juſt below the inſertion of each leaf, and are by no means terminal. Probably they might appear ſo in the early ſtate in which Rheede delineates them, and that appearance might be deſtroyed by the ſubſequent growth of the branches. His deſcription of the leaves is peculiarly exact. Nothing is ſaid in the Hortus Malabaricus to authorize the report of Gamboge being the produce of this tree. Dr. Roxburgh, in the deſcription of his *Xanthochymus pictorius*, Plants of Coromandel, v. 2 t. 196, ſays the full-grown but unripe fruit of that tree produces, when wounded, a copious yellow acrid gum, uſeful in painting, very like *Gummi Guttæ*, or Gamboge, but he gives us no information concerning the origin of the latter. Linnæus received for the *Cambogia* a widely different plant, his own *Aſclepias carnoſa*, Sm. Exot. Bot. t. 70.

4. G. *cornea*. Linn. Syſt. Veg. ed. 13. 368. (Lignum corneum; Rumph. Amb. v. 3. 55. t. 30: not v. 2, as copied by Murray and Willdenow.)—Leaves elliptical, ſomewhat ovate, ſhining; their veins unequal and irregular. Flowers terminal, ſolitary, drooping. Branches quadrangular,

gular.—Native of the mountains of Amboyna. *Rumphius.* A tall, but not very large *tree*, whose ultimate branches are short, tufted, acutely quadrangular, with a smooth green bark. *Leaves* opposite, in pairs crossing each other, from eleven to fifteen inches long, and four broad, but on old trees shorter; smooth, firm, and shining, with one thick rib, which is furrowed above and triangular at the back, sending off many fine transverse veins, not exactly parallel nor united. *Footstalks* short and thick, sometimes so curved as to render the leaves resupinate. *Flowers* solitary at the end of each branch, on curved stalks, of four firm thick yellow petals, slightly fragrant. *Fruit* the size of a plum, globose, brown, even, crowned with the stigma which resembles the head of a nail, full of glutinous pulp, lodging semilunar seeds. A viscid liquor issues from its coat, as well as from the branches, when wounded, which turns yellow in drying. The wood is extremely hard and horny, white when fresh, but soon turning reddish or yellowish.

We have a Java specimen, marked with the Malay name *Moendoe*, which appears to be what Rumphius means p. 56, by *Munda* of the Malays, and which those people esteem the same with his *Lignum corneum*. Our specimen agrees very exactly with his account as to the leaves, and the extreme hardness of the wood, but the flowers are smaller, and grow at the base of the younger branches. We dare not describe it as a distinct species, because there seems to be a mystery about the inflorescence of this whole genus, which we cannot solve for want of an opportunity of tracing its progress in a growing state.

5. G. *dioica.* (G. cornea; Roxb. MSS.)—Leaves elliptic-lanceolate, pointed at each end; their veins unequal. Flowers two or three together, drooping, dioecious. Branches round.—Native of the East Indies, communicated to us by lord viscount Valentia from the Calcutta garden. The *branches* are slender, numerous, opposite, very slightly angular when young only. *Leaves* two or three inches long, elliptic-lanceolate, entire, pointed at each end, opaque, their veins rather numerous, but very unequal, irregular and subdivided. *Footstalks* angular, channelled. *Flowers* either at the ends, or about the lower part, of the young branches, two or three together, on short angular drooping stalks, each about the size of a hawthorn blossom; male on one tree, female on another. The latter seem to have the shortest stalks, and of three at the end of a branch in our specimen, one only is fruitful, having the germen swelled to the size of a black currant, with a large, tumid, lobed and wrinkled stigma. We cannot find any figure or description applicable to this species, unless it be the following. It does not at all agree with the preceding.

6. G. *Morella.* (Mangostana Morella; Gærtn. v. 2. 106. Kannawakoraka; Herm. Mus. Zeyl. 26, not 76. Arbor indica, Gummi Guttam fundens, fructu dulci rotundo, cerasi magnitudine; Burm. Zeyl. 27.)—Leaves roundish. Stigma four-lobed. Berry of four cells.—Native of Ceylon about Columbo. *Burmann.* A handsome *tree* of a moderate height. *Leaves* round, green, succulent. *Fruit* the size of a Morella Cherry, eatable, containing four seeds only, in a sweet pulp, streaked with yellow. From the bark of this tree when wounded flows a copious yellow juice, which gradually hardens into a smooth gum, proving emetic and purgative.—Such is Burmann's account, and Hermann expressly says that the best Gamboge (*Gummi Gambæ*) comes from this tree, which he esteems the Carcapuli of Acosta; the description of which latter agrees rather with our G. *Cambogia.* Hermann says the Carcapuli of Acosta and that of Linschoten differ in flower and fruit, but agree in other respects, and both produce Gamboge, though that of the Kannawakoraka is the best. It seems therefore certain that our *Garcinia Morella* is the true Gamboge plant. We have never seen specimens of this species in any state. It is to be hoped that some light will be thrown on this obscure subject by Mr. W. J. Hooker who has recently undertaken to investigate the botany of Ceylon.—At the end of this genus in Willdenow, p. 849, is an observation copied implicitly from Linn. Mant. 2. 391, which is altogether a mass of confusion. *Mangium sylvestre* ought to be *Lignum corneum*; p. 77 ought to be 55; and the whole alluded to G. *cornea* as different from G. *Mangostana*, before the former was regularly adopted as a species. So precarious is blind transcription! S.

GARCON, or GARSOON, a French term, literally signifying a boy, or male child, any time before his marriage.

It is also applied to divers inferior officers among us called *grooms*, *garçiones*. Thus all the servants in the French king's chambers, wardrobe, &c. who performed the lesser offices thereof under the proper officers, were called *garçons de la chambre*, *de la garderobe*, &c.

GARD. See GUARD.

GARD, *Ravishment de.* See RAVISHMENT.

GARD. *Corps de* GARDE. See CORPS.

GARD, in *Geography*, a department of France, in the south-east region, bounded on the north by the departments of the Lozere and Ardeche, on the east by the Rhône, on the south by the Mediterranean and the department of the Herault, and on the west by the departments of the Herault and the Aveiron. Nîmes is its capital. This department, situated in 44° N. lat., is composed of the dioceses of Nîmes, Alais, and Uzès, contains 292 square leagues, and 309,052 inhabitants, in 38 cantons, and 365 communes, and is divided into four districts, *viz.* Alais, whose inhabitants amount to 65,446, Uzès, 72,033, Nîmes, 113,785, and Le Vigan, 57,788. Its contributions amount to 2,866,398 francs, and the expences charged upon it for administration, justice, and public instruction, are 311,120 fr. 66 cent. Intersected by hills, the soil is, in general, abundantly fertile, producing grain, wine, delicious fruits, oil, and pastures. It has mines of copper, iron, vitriol, and other minerals, quarries of marble, and mineral springs.

GARDA, a lake of Italy, between the Veronese and the Bressan, about 30 miles long, and from two to seven wide.—Also, a town of Italy, in the Veronese, on the east bank of the lake above-mentioned. In the time of the Guelphs and Gibellines it was a celebrated fortress with a citadel; but at present it is an open place; and on the ruins of the citadel has been built an hermitage, or convent, of the Carthusian monks; 16 miles N.W. of Verona. N. lat. 45° 36'. E. long. 10° 43'.—Also, a town of Hindoostan, in Orissa; 75 miles S.E. of Cattack.

GARDANE, JOSEPH JAMES, in *Biography*, was born at Ciotat, in Provence, and after he had been created doctor of the faculty of Montpellier, he repaired to Paris, where he again received the same degree. His talents procured him the honour of a place in the academies of Montpellier, of Nancy, of Marseilles, and of Dijon; and by his zeal he obtained the appointment to the Bureau des Nourrices, and to two hospitals at Paris. In this city he was actively employed, during several years, in contributing to the prevention and cure of the most destructive and loathsome diseases which afflict mankind, especially the small-pox and the lues venerea. He published a considerable number of treatises, at Paris, between the years 1767 and 1776, chiefly relating to the two diseases just mentioned. Eloy. Dict. Hist.

GARDANNE, in *Geography*, a town of France, in the department of the mouths of the Rhone, and chief place of a can-

a canton, in the diſtrict of Aix; 4 miles S.S.E. of Aix. The place contains 2279, and the canton 7529 inhabitants, on a territory of 167½ kiliometres, in 6 communes.

GARDANT, in *Heraldry*. See GUARDANT.

GARDE, in *Geography*, a town of Hinder Pomerania, on a freſh-water lake, abounding with fiſh, near the ſea; 18 miles N.E. of Stolpe.

GARDECAUT, or GARD DU CORD, in a watch, that which ſtops the fuſee, when wound up, and for that end is driven up by the ſtring. Some call it *guard-cock;* others, *guard du gut.*

GARDEFAN, CAPE, or *Straits of Burial*, in *Geography*, as it is called by the Abyſſinians, or *Cape Gardefui*, as it was denominated by the Portugneſe, the *Promontorium Aromatum* of the Romans, denotes that point of the Abyſſinian coaſt of the gulf of Suez, which ſtretches out into the gulf before you arrive at *Babelmandeb;* which ſee. See alſo *Cape* DEFAN.

GARDEIAH, a town of Africa, the capital of Beni-Mezzab; 180 miles E. of Fighig. N. lat. 32° 15′. E. long. 2° 30′.

GARDELEBEN, or GARDELEGEN, a town of the Old Mark of Brandenburg, containing four churches, four hoſpitals, and a manufacture of cloth; celebrated for its beer; 72 miles W. of Berlin. N. lat. 52° 32′. E. long. 11° 36′.

GARDEN, ALEXANDER, in *Biography*, an eminent botaniſt and zoologiſt, was born in Scotland, in January, 1730, and educated at the univerſity of Edinburgh; where he ſtudied botany according to the Tournefortian ſyſtem under Dr. Alſton, and where, probably, he took the degree of doctor of phyſic. He ſettled as a phyſician at Charleſtown, South Carolina, in 1752, and ſoon after married. From his firſt arrival in America he had betaken himſelf to the inveſtigation of the vegetable productions about Charleſtown, with the aſſiſtance of the works of Tournefort and Ray; but he found the greateſt difficulty in aſcertaining his diſcoveries, and eſpecially in reducing ſuch plants as appeared nondeſcripts to their proper places in the ſyſtems of thoſe writers. New ſections were neceſſarily to be formed at every ſtep to admit what they had never ſeen, and the uncertainties attendant on generic or ſpecific diſcrimination were inſurmountable, on account of the great affinity and yet conſiderable difference between American botany and that of Europe, to which the ideas and ſyſtem of Tournefort in particular were accommodated. In the midſt of this perplexity, Dr. Garden met with the *Fundamenta Botanica* and *Claſſes Plantarum* of Linnæus, as well as the *Flora Virginica* of Gronovius. Theſe books, eſpecially the firſt, delighted him ſo much, that he introduced himſelf to the correſpondence of Linnæus in March, 1755, by an elegant and enthuſiaſtic Latin letter, in which he expreſſed his admiration at the clearneſs, didactic preciſion, and ingenuity of theſe writings, and his gratitude for the benefits which he had derived from their repeated peruſal. In the ſummer of 1754 he had been obliged, by indifferent health, to take a journey through ſome of the northern provinces, and viſited Mr. Colden, near New York; where, alſo, he became perſonally acquainted with the celebrated John Bartram, then juſt returned from an excurſion to the Blue mountains. Equally ſtruck with the knowledge and with the candour of theſe men, he became ardently attached to them. "Viri," ſays he, in the above letter, "quorum ut ſumma eſt in arte ſapientia et induſtria, ſic et intemerata fides.

——— animæ, quales neque candidiores
Terra tulit."

He had ſcarcely diſpatched this firſt letter, when he received from Europe the *Critica* and *Philoſophia Botanica*, *Amœnitates Academicæ*, and *Syſtema Naturæ*, works well calculated to confirm and to increaſe the taſte he had with ſo much zeal adopted. From this time, therefore, during his ſubſequent reſidence in Carolina, he was a profeſſed and ardent botaniſt, the correſpondent, not only of Linnæus, but of Gronovius, Collinſon, Ellis, and occaſionally of moſt other diſtinguiſhed naturaliſts in various parts of the globe. In his firſt attempt at founding a genus, which he communicated to the great Swediſh naturaliſt by the name of *Elliſia*, he was unfortunate, the plant he deſcribed being *Swertia difformis;* ſee FRASERA. Nor was he more ſucceſsful in his next, which proved a *Styrax*, the *lævigatum* of Hort. Kew. v. 2. 75. Linnæus, however, was not at firſt aware of this, and deſtined the ſuppoſed new genus to commemorate Dr. Hales; nor is it certain that he ever diſcovered his miſtake after Ellis had eſtabliſhed a truly diſtinct *Haleſia*, like the *Styrax* in flower and habit, but very different in fruit. At leaſt the *H. tetraptera*, and the leaves, though not the fruit, of *H. diptera*, in the Linnæan herbarium, are both *Styrax grandifolium* of Hort. Kew. The *Stillingia* and *Fothergilla* of Dr. Garden, ſent in 1765, have finally been eſtabliſhed; his *Cyrilla* and *Hopea* have been reduced, the former to *Itea*, the latter to *Symplocos*, by L'Heritier and ſucceeding botaniſts. He was therefore leſs happy than Ellis in the diſcovery of new genera, but it does not follow that he had leſs botanical ſkill. Who can hope always to decide irrevocably on this ſubject?

Linnæus was anxious to obtain from Dr. Garden a knowledge of the inſects, and eſpecially the fiſhes, of South Carolina, and in this he was not diſappointed. The deſcriptions of Garden were altogether Linnæan, and were accompanied by ſpecimens of the ſkins of all the fiſhes, ſpread and dried on a board. He had a black ſervant who was peculiarly dextrous at this operation, ſo as to preſerve the outline of the fiſh, and every important character, with great accuracy. Well aware, nevertheleſs, that in many caſes an entire ſpecimen is abſolutely neceſſary, he ſent many fiſhes and reptiles in bottles of rum, among which were various ſpecies of tortoiſes, lizards, and ſerpents. Hence his name occurs more frequently than that of any other perſon in the Syſtema Naturæ under the claſſes of *Amphibia* and *Piſces*. His moſt celebrated diſcovery was that of the *Siren lacertina*, of which he ſent a deſcription with ſpecimens to Upſal in the ſpring of 1765, and which ſeemed to him a middle link between *Lacerta* and *Muræna*. In Auguſt, 1766, he wrote to Linnæus in Engliſh as follows. "It gives me much ſatisfaction that you had ſome pleaſure in viewing and examining the extraordinary two-legged animal which I ſent you laſt year. We have numbers of them in this province. They live in dams and ponds of freſh water, and in low marſhy grounds all over the province. I have ſeen them of all ſizes, from four inches to three feet or 3½ in length. They always appeared to me to be the ſame animal in every thing but magnitude, and we have none of the *Lacertæ* in this country, except the alligator, that ever grow to above ſix or ſeven inches in length at moſt; and all theſe are land animals, never uſing or living in water but when driven into it. I think you may depend on this being no *larva* of any animal, but a real diſtinct genus by itſelf. In one that I opened laſt ſpring, I think I ſaw the male ſperm, or what we call the ſperm of fiſhes. I ſend you an entire ſpecimen in ſpirits, with the ſkin, head, and vertebræ of the neck, of a pretty large one. Laſt year I deſired my ſervant to daſh the head of one againſt a ſtone to kill it; but he, miſapprehending me, daſhed the whole animal forcibly againſt the ground; when

when to my furprife it broke off fhort into three or four pieces, juft in the fame manner as the glafs fnake does when ftruck. From this I judged it was not of the eel kind, whofe fkin and mufcles are remarkably tough. Though I never yet have been able to know ocularly whether they propagate their fpecies in this form, yet I have great reafon to believe it, for we fhould certainly meet with them in their perfect ftate if thefe were only *larvæ*, but we pofitively have no animal that refembles them."—Linnæus found, as he thought, fo great a peculiarity in the organs of refpiration in this animal, it having apparently both gills and lungs, that he was induced to eftablifh a new order of *Amphibia* to receive it, which he named *Meantes*; fee the laft leaf of the 1ft vol. of Syft. Nat. ed. 12. This new order was to follow the *Serpentes* at p. 393, not 395. A differtation on the *Siren lacertina* is alfo to be found in Amœn. Acad. v. 7. 311. t. 5: and Ellis wrote a paper on the fubject, which appears in the Philofophical Tranfactions, v. 56. 189. t. 9. Among the moft curious confequences of this difcovery was a letter written to Dr. Garden by the famous fir John Hill, which he once fhewed to the writer of this account. That ingenious but arrogant philofopher affured him, that he himfelf "had diftributed all the known productions of nature into a feries or chain, according to their refpective affinities, marking each genus, or link of that chain with a number. That there were occafional interruptions in this feries, where he had placed numbers for certain productions, which he knew *muft exift*, but had not yet difcovered, and that the *Siren* precifely filled up one of thefe vacant numbers!" This prefumption, fo different from his own patient and practical inveftigation of nature, fo difgufted Dr. Garden, that he immediately declined all further intercourfe with fir John, anfwering that "he was himfelf but a humble obferver, and felt unworthy of correfponding with a man who feemed to be fo intimately in the councils of the Almighty and Allwife Creator."—All naturalifts, however, did not embrace the *Siren*, to their own confufion, with the ardour of fir John Hill. The learned Camper difputed its pretenfions to form a new order, or even a genus, and reduced it to *Muræna*, where it now ftands in Gmelin's edition of the Syftema, v. 1. 1136, by the name of *Muræna Siren*.

In a letter dated May, 1770, Dr. Garden gave Linnæus an account of what is called in South Carolina the Potatoe Loufe, "a venomous infect, of a bright red colour, extremely minute, inhabiting for the moft part the rotten trunks of trees. Though this infect is fo very fmall as to be fcarcely difcernible, it occafions the moft ferious mifchief. In fummer, the feafon of its greateft vigour and abundance, thofe perfons who incautioufly lie down upon the ground, fit upon fallen trees, or even walk where it abounds, are attacked by great numbers of thefe vermin at once, which immediately overrun all parts of the body, not only wounding the fkin and inferting their poifon, but introducing themfelves under the cuticle, and occafioning itching that foon becomes intolerable, with fubfequent inflammation and fwelling, attended with a piercing burning pain. Very often a fever fupervenes, and fmall itching ulcers are formed. The infect in queftion is quite different from that kind of flea called by Catefby the Chigo, or Chigger." In fome of his letters Dr. Garden finds great fault with the writer laft named, whofe whole work, he fays, "but efpecially the 2d volume, is fo incomplete, and abounds with fuch grofs errors, that it would be no fmall tafk to amend and complete it; and that he never confulted it without indignation and difguft, at feeing the moft beautiful works of the Creator fo miferably defaced and mutilated, and fo ill reprefented."—The above Potatoe Loufe proved the *Acarus Batatas*, Syft. Nat. v. 1. 1026.—In the fummer of 1770 Dr Garden fent an intelligent negro fervant to the ifland of Providence for the purpofe of collecting natural curiofities, and efpecially fifh, this being, as we prefume, the man abovementioned who excelled in their preparation. His harveft, however, on this occafion, was much lefs abundant than might have been expected, in confequence of a ftorm in his voyage back, which fo terrified him, that he forgot all neceffary attention to his collection, in fears for his own life. What arrived in tolerable order were fent to Linnæus, and among them were feveral new or curious fifhes and infects. The laft letter of Dr. Garden to Linnæus in our poffeffion is dated May, 1773, and contains a critical account of the fructification of *Zamia pumila*. Soon after this period the political difturbances in America interrupted his fcientific correfpondence, and finally obliged him, as having joined the loyalifts, to quit that country and take refuge in Europe. He left a fon behind him, but was accompanied to England by his wife and two daughters. We are not informed of the precife time of his arrival in England, but it appears, from the records of the Royal Society, that, though elected a fellow of that fociety June 10, 1773, he was not admitted till May 15, 1783, the latter being probably his firft opportunity of attending in perfon after he came to London, where he refided till his death, which happened April 15, 1791, in the 62d year of his age. He had, in confequence of the recommendation of Linnæus, been elected a member of the Royal Academy of Upfal in 1761.

Dr. Garden had for the greater part of his life laboured under a delicate ftate of health. He was afflicted with conftant fea-ficknefs throughout his voyage to America, which deterred him from any excurfions by fea during his abode there, though he ardently wifhed to examine fome of the Bahama iflands in particular. His practice as a phyfician, though very extenfive, was frequently interrupted by the ftate of his own health, and he was obliged to indulge in the relaxation afforded by a country-houfe and garden, where he delighted to cultivate in luxuriance the choiceft plants of American growth. The fcarlet honeyfuckle, entwined among the delicate *Chionanthus*, formed the favourite decorations of his bowers; for it was not fo much rarity or fingularity, as beautiful nature, that he loved. His returning voyage was attended with the fame diftreffing inconvenience, and this caufed a rupture of a veffel in the lungs. This accident, in a frame ftrongly predifpofed to pulmonary confumption, with a fair, florid complexion, foon produced that diforder, which finally proved fatal. In perfon, Dr. Garden was tall and thin, with regular features, peculiarly animated eyes, and a benevolent prepoffeffing countenance. We have elfewhere obferved, that "few characters could be more juftly beloved in private, nor were fenfibility and cheerfulnefs ever more happily combined. He was an American loyalift, free from party bigotry. In fcientific purfuits, he fought only truth and nature, for their own fakes, ever unaffuming and unambitious, while his name gave authority throughout Europe wherever it appeared. The elegant and fragrant *Gardenia*, dedicated to him by his friend Ellis, is worthy to perpetuate his name." S.

Garden, a portion of ground laid out for the purpofe of ornamental effect, or the raifing and providing different forts of plants of the flowery, herbaceous, and efculent kinds, as well as various other vegetable productions and fruits by proper cultivation and enclofure.

It is evident, from many different circumftances, that the introduction of gardens almoft immediately fucceeded that of the art of building houfes, and, of courfe, became the

natural

natural attendants of property and individual poffeffion at an early period. It was foon found convenient to have various forts of plants and herbs at hand, inftead of feeking them at a diftance when they were wanted. As the art of cultivation became more general, and its advantages more fully underftood, the expediency of having diftinct inclofures for the purpofe was rendered obvious.

Orchards and vineyards were afterwards had recourfe to as luxury increafed, and habitations became more general. The ancient gardens feem to have been chiefly of this kind, varioufly intermixed with works of art, as fountains, grottos, porticos, ftatues, fhady walks, baths, &c. &c.

Modern gardens are, however, moftly divefted of all thefe heavy and unnatural ornaments, being more fimple imitations of nature, contrived for the purpofe of produce and pleafure.

Gardens are ufually diftinguifhed, by the nature of their products, into the ornamental, or flower, and kitchen kinds, the laft being chiefly deftined to the raifing of ufeful culinary roots, plants, and vegetables. There are alfo nurfery gardens, which are principally employed in raifing trees, fhrubs, &c.

Where gardens of the firft fort are neceffary, they fhould be laid out fo as to have open funny fheltered expofures, forming, if poffible, the connections between the ornamented, or pleafure-grounds, and the kitchen-gardens, according to the general nature and fituation of fuch grounds, fo as to afford the moft ftriking effect and variety that are poffible.

The nature of their forms may vary in proportion to the diftribution of the lands, and the particular circumftances of their fituations, being made fquare, circular, oblong, or in any other manner, according to the tafte of the proprietor; the parts approaching the ornamented grounds being moftly feparated by walks, and the introduction of different forts of the moft curious, hardy, flowering, fhrubby plants. The interior parts fhould have a neat ornamental diftribution, fo as to produce the moft ftriking variety when the flowers are in blow, and afford the greateft convenience in their cultivation. It was formerly the practice to have them laid out with walks furrounding the outer boundaries, or borders being introduced all round within them and the inner compartments, divided into a variety of narrow ftraight borders, or plain four-feet wide parallel beds, having two-feet wide alleys between; the whole of them being laid in a rounding form, and neatly edged with dwarf-box, or fome other plant fuited to the purpofe; and the walks and alleys laid with the fineft fand; but at prefent they are moftly arranged fo as to fuit the nature of the fituation, produce the moft ornamental effect, and afford the greateft eafe, convenience, and fuccefs in the culture of flowers, &c.

Gardens of this nature fhould contain all the different forts of hardy, curious, ornamental flower-plants, whether of the bulbous, tuberous, or fibrous rooted kinds, and be conftantly kept in neat order.

The fecond fort, or kitchen garden, fhould be laid out in different methods, according to the differences in the circumftances of the ground. It is fometimes fo managed, as to conftitute a part of, or communicate with the pleafure-ground; but where there is fufficient extent of land, it is better to be diftinct, or detached from it, and in every cafe as much concealed from the houfe as poffible. The moft convenient diftribution is at fome diftance behind it; but on the fides may anfwer very well, efpecially when not too contiguous, or fo fituated as to interrupt any particular profpect or view of the adjacent country.

Expofure.—With regard to the nature of the fituation moft proper for this purpofe, it fhould, when convenient, be where there is a gentle declination towards the fouth, or fouth-eaft, in order that it may have the full advantage of the morning fun.

The nature of the expofure of a garden is a matter of confiderable importance, as not being capable of change like thofe of fhelter, foil, &c. It has been obferved, by a late writer on "Country Refidences," that the beft expofure for a garden is that of the fouth-eaft, but that in an extenfive and complete garden, it is defirable that part of it fhould have a northern afpect, in order that late crops may be raifed with advantage. And this, it is fuppofed, may often be attained, either by fixing upon both fides of a gentle fwell, or eminence, or on the two oppofite fides of a hollow or depreffion. Should fuch a hollow wind in any confiderable degree, every fort of expofure would at once be had without difficulty, and moftly in combination with fhelter and proper foil.

Situation.—This fhould be relative to the nature of the reft of the place, and the convenience of water. It fhould be fomewhat contiguous to the neceffary offices, ftables, &c. and at no great diftance from the farm, being concealed as much as poffible from general view, and fo contrived, as to interfere but little with picturefque improvements. It fhould be fo near a fupply of water as to have it in abundance for the common purpofes of watering during the whole of the fummer months. And it may be ufed in other ways with advantage, in particular fituations and circumftances. It is a common but dangerous error to form gardens in too low fituations, in order that they may have the benefit of natural fhelter, as they are very liable to the effects of hoar frofts, blights, and mildews. Mr. Forfyth remarks, in his "Treatife on the Culture and Management of Fruit Trees," that if a garden "be fituated in a bottom, the wind will have the lefs effect upon it; but then the damps and fogs will be very prejudicial to the fruit and other crops;" and that when "fituated too high, although it will, in a great meafure, be free from damps and fogs, it will be expofed to the fury of the winds, to the great hurt of the trees, by breaking their branches, and blowing down their bloffoms and fruit."

Shelter.—A garden fhould, in this writer's opinion, "be well fheltered from the north and eaft to prevent the blighting winds from affecting the trees, and alfo from the wefterly winds, which are very hurtful in the fpring or fummer months." Where it is not "naturally fheltered with gentle rifing hills, which are the beft fhelter of any; plantations of foreft-trees fhould," he thinks, "be made at proper diftances, fo as not to fhade it." Thefe, he fuppofes, will be found the beft fubftitute, but at the fame time the fun and air fhould be freely admitted. On this account it is fuppofed that "a place furrounded by woods is a very improper fituation for a garden or orchard, as a foul ftagnant air is very hurtful to vegetation." It is likewife added that "blights are much more frequent in fuch fituations than in thofe that are more open and expofed." In thefe fheltering plantations, it is well advifed that fruit-trees fhould be intermixed with thofe of the foreft kind, which, befides being advantageous in the way of affording fhelter, ornament, and fruit, become nurferies for raifing foreft-trees. But where the fituations will not admit of this, he fuggefts the propriety of planting fome crofs rows of fruit-trees in the garden, at the diftances of about forty or feventy yards from each other, more or lefs, according to the extent: where the length is confiderable, one row may be fufficient on each fide; but in fhort crofs rows, two on each fide the walks or paths. In this intention the trees fhould be planted oppofite one another, but in fuch a manner that thofe in one row may be oppofite to the middle parts of the open

open ſpaces in the others. In this method, beſides the ornamental effect that is produced, the force of violent winds is broken, and much damage to other trees prevented.

In this view, the beſt ſort of trees, according to the ſame writer, is that of dwarfs, with ſtems about two feet high, which may readily be provided by removing the lower branches.

The author of the Treatiſe on Country Reſidences adviſes "that the planting ſhould be performed on all ſides of the garden, the diſtance being proportioned according to the particular circumſtances of the caſe. But when the garden is upon the perfect flat, the neareſt foreſt trees ſhould not, in common, be within leſs than one hundred feet of the outer fruit wall, nor on the ſouth ſide within leſs than one hundred and twenty or thirty feet of it; where however it is upon a high riſing bank, they may ſometimes be admitted to come as near as fifty or ſixty feet. It is likewiſe in moſt caſes a good way to form a deep ſunk fence between ſuch trees and the garden ground, eſpecially when they are of the fir tribe, in order to prevent the roots from running too much in the ſurface mould of the garden."

Soil.—In fixing upon ground for a garden, it is likewiſe a point of much importance to have the natural ſoil of a good quality, being ſufficiently dry, mellow, and capable of being eaſily wrought in all ſeaſons, as well as of a good depth, as from a foot and a half to three feet. And if the ſurface be uneven, it will be the better, as there will be a greater variety in the quality, and of courſe it will be more fully adapted to the culture of different crops. The moſt proper ſort of ſoil for this purpoſe is that of the rich, friable, loamy kind, and the worſt thoſe of the very light, ſandy, and ſtiff clayey deſcriptions. But the properties of ſoils may be much improved in moſt caſes by a judicious application of different ſorts of materials in the way of manure.

Some think a medium loam the moſt proper, as being capable of being made of different degrees of lightneſs in different parts, by the addition of ſand and other ſimilar materials, ſo as to ſuit different ſorts of vegetables; and in others of various degrees of tenacity and heavineſs, by the uſe of clay or other coheſive ſubſtances.

Where the under ſoil is of the retentive kind, great care ſhould be taken to have it well drained, as unleſs this be effectually accompliſhed, healthy vegetables or trees can ſeldom be produced. See Soil and Manure.

In caſes where fruit-trees, eſpecially thoſe of the finer ſorts, as well as apple and pear kinds, are to be planted, a greater depth of good ſoil, as well as a greater degree of dryneſs, is neceſſary in general than that mentioned above.

Form.—There are very different opinions in reſpect to the moſt proper and advantageous forms for this ſort of culture; but though much muſt depend on the nature of the ſituation, where the ſpade is to be made uſe of in performing the work, the ſquare ſhape, or that which approaches neareſt to it, is probably the moſt convenient. In other caſes, where the principal part of the work is, from the difficulty of procuring labourers, and the increaſing expence of them, to be executed by the plough, the oblong and circular forms may be the moſt ſuitable, as they may be wrought with greater facility and convenience. The ſhape of the garden is uſually decided by the walls, but that which is moſt adapted to the general purpoſes of cultivation is, in the opinion of the above writer, that of a parallelogram; though were the chief object the production of wall-fruit, the oval form with its long diameter from eaſt to weſt would be better, as containing the ſmalleſt quantity of wall hid from the ſun, and a large portion of it conſtantly expoſed to the ſouth. But as all forms, except thoſe of the ſquare kind, derange the regulation of the quarters, and are conſequently troubleſome in digging and cropping, they are in general properly diſcarded, except in ſome flower-gardens, where fruits are raiſed on the walls.

Size.—The ſize of kitchen-gardens ſhould always be fully ſufficient for the extent of the family, varying from half an acre to four, five, or more, within the fence. The firſt quantity, where there are wall and eſpalier trees, will furniſh ſufficient employment for one man, and afford due ſupplies of vegetables and fruit for families, conſiſting of a dozen or more perſons. But much in theſe reſpects depends upon proper care and management. The nature of the ſoil ſhould alſo be taken into the account in determining this point.

Incloſing.—The methods of incloſing that are purſued in theſe caſes vary according to the facility of procuring materials on the particular ſpots. Some adviſe the boundary fence to be a ſunk one, with a hedge or low wall; but others think the beſt mode of incloſing garden-ground is by means of brick walls, where that ſort of material can be eaſily procured, and expence is not an object. But oak paling fences anſwer the purpoſe very well. Theſe fences, whether made of brick or wood, ſhould be eight, ten, or twelve feet in height. Where the extent of walling is ſufficient, Mr. Forſyth thinks ten feet walls better than ſuch as are higher, as being more convenient for various purpoſes. He alſo adviſes that they ſhould have borders or ſlips on the outſides of them, of from forty to ſixty feet or more in breadth, where the ground can be ſpared, which ſhould likewiſe be incloſed by an oak paling, ſix or eight feet in height, having a *chevaux de friſe* at the top to ſtrengthen the fence, and render the garden more ſecure. The latter may be conveniently formed, by planting a piece of wood four inches in breadth, and an inch and quarter in thickneſs, into the ſhape of the roof of a low pitched houſe on the upper ſide, then drawing a line on each ſide from end to end, at the diſtance of about an inch and quarter from the upper edge, driving twelve-penny nails through them in regular rows, at the diſtance of four inches from each other, ſo as to come out near the upper edge of the contrary ſide; each being oppoſite the middle of the ſpace between two nails on the other ſide. The nail heads ſhould be ſunk, and ſtrips of wood nailed over them, tenter-hooks being driven in between the nail points, and the whole nailed faſt to the outſide top of the fence; continuing pieces in this way till the whole is completed and rendered ſecure. It is ſuppoſed that by means of theſe incloſed borders or ſlips on the outſide of the garden walls, there will be plenty of ground for gooſeberries, currants, and ſtrawberries, and both ſides of the walls may be planted with trees, by which there will be a conſiderable increaſe of wall-fruit. And where there are parts of ſuch ſlips lying near to the ſtables, ſufficiently ſheltered and expoſed to the ſun, they may be converted to the purpoſes of a forcing-ground for raiſing melons, cucumbers, and other ſimilar kinds of fruit.

The advantages of this are that there will be no litter carried within the walls, to dirty the walks; the beds will be concealed from the ſight, and much time and labour ſaved in carting and wheeling the dung and other matters.

Where there are not theſe ſorts of ſlips, the forcing-grounds for melons, cucumbers, &c. ſhould be made in ſituations that are warm, and open to the influence of the ſun, being well incloſed, and as contiguous to the ſtable as the nature of the ſituation will admit. It is added that the great objection to having ſlips or borders on the outſides of the walls of gardens is that of the vaſt expence of erecting

two fences, where one is capable of anfwering the purpofe, and by proper attention in the diftribution of the internal parts, with perhaps nearly equal advantage.

The author of the work on "Country Refidences," after obferving that the northern fide of fuch garden-ftrips fhould be referved for common crops, and the fouthern for early ones, fuggefts that a fhrubbery may in fome inftances be introduced with propriety in a part of the fpace towards the plantation, fo as to range in order with mixed plants, from the humbleft fhrub in the edge of the walk, to the higheft foreft trees. In this way complete fhelter may be afforded, and at the fame time an agreeable effect produced at moft periods of the year. But in many cafes its place may be fupplied fimply by a fingle holly hedge placed on the top of the funk fence, by which means a larger portion of ground may be applied to the raifing of culinary vegetables, and the character of utility be more fully preferved. It occafionally happens, from the declination of the ground in a foutherly direction, that the uniformity of fuch "outer inclofure can be broken, and a large bay or recefs be made in the wood, either to contain all the hot-houfes, hot-beds, &c." or the latter only; which is always a great advantage.

Subdivifion.—In the diftribution of the quarters or parts of the garden, attention fhould be had to the nature, form, and extent of the ground, fo as that they may be laid out in the beft manner, in refpect to the convenience of managing them, expofure, and fize; but they fhould never be made too fmall, as there will be much lofs of ground by the walks, which are effentially neceffary in their cultivation. With regard to their form, it may vary according to circumftances, or the tafte of the proprietor; but the moft convenient and economical one, in refpect to ground, is the fquare, where the garden has been laid out in that manner. It is ufual to have borders round the whole of the inclofing fences, whether they be conftructed of brick, ftone, or timber; and where there are crofs walls, they are generally introduced on the fides of them. The breadths of thefe fhould be proportioned to the height of the walls or palings, and the extent of the garden, as from fix, to eight, ten, and twenty feet, efpecially thofe which have a fouthern afpect, and are intended for the reception of fruit-trees, as their roots will have more room to extend themfelves and procure due nourifhment. Befides, wide borders are the moft advantageous and economical in the culture of different vegetable crops.

Where the gardens are large, other borders may be carried along on the fides of the walks, between them and the efpalier or ftandard fruit-trees; but in other cafes this is inconvenient, as taking up too much of the quarters. Thefe fhould not exceed fix or eight feet in breadth.

With fome it is the practice to have the edges of the borders made firm and even, and planted with dwarf box, or fome other plant made ufe of for the purpofe; but as thefe forts of edgings are very liable to be deftroyed in different places by wheeling over them, and by that means become unfightly, it is probably a better method to only have the edges of the border made up firm and even, clofe to the gravel of the walks.

Walks.—In common there fhould be a walk introduced on the fides of the borders all round, and likewife in the middle where the ground is of confiderable extent. Crofs walks are alfo neceffary where the garden has a great length. But as walks take up much ground, there fhould be as few as poffible. Thofe on the fides of the borders need not have more breadth than from four to fix feet; but the middle one fhould be feven feet wide, in order that a cart may be admitted when neceffary.

It is alfo neceffary to have walks about two feet or two feet and a half wide, and the fame diftance from the walls, where there are wall-trees, for the convenience of pruning, training, and nailing, as well as that of gathering the fruit, and admitting a barrow or garden-engine for watering them.

And befides thefe permanent walks, when the gardens are of much extent, trodden path-walks will be requifite in different parts, for the convenience of cultivation, and as divifions between the crops of different kinds.

All the firft forts of walks fhould be laid out in a regular manner, and be firmly made up with brick rubbifh, ftone-mafons' chippings, or fome other coarfe material; and neatly gravelled over. For this laft purpofe binding fand anfwers extremely well, alfo good clean fifted road drift, as they may be readily kept clean by the hoe and rake; but fea-coal afhes are preferred by fome, as being ftill more dry and firm, more eafily kept in order, and cleaner to walk upon in thaws, as well as ufeful, while new and rough, in preventing flugs from travelling over them from the different quarters of the ground.

The narrow walks on the back fides of the borders near the fruit-trees, need not be laid with any fort of coarfe rubbifh, being merely covered over to the depth of a few inches with fand or fea-coal afhes, as by this means the ground may be occafionally dug up, and the path re-laid.

Whatever fort of material is made ufe of in forming the walks, it fhould be fpread in a neat even manner, fo as to leave them in a regular moderate convex or rounded form, by which the water will be readily carried off to the fides, and the walks kept perfectly dry. After the furface material has been thus applied, and evenly raked over, it fhould be firmly rolled down by a heavy iron roller, and occafionally repeated after being well moiftened with rain.

Sometimes walks are laid with turf or fward, but this is a very improper material, as being troublefome to keep in order, and foon rendered difagreeable to the fight, by being wheeled and trampled upon in the work of the garden.

Walls.—In building the walls of kitchen-gardens, when the height is confiderable, the foundation fhould be from two to two bricks and a half in thicknefs, and the off-fet not more than one brick above the height of the level of the border, being then brought to a brick and a half in thicknefs; where they are extenfive, they fhould be ftrengthened by piers at the diftance of from forty to fixty feet, according to their height. The projection of thefe piers fhould not be more than about half a brick before the furface of the wall. Walls for fruit-trees fhould always, if poffible, be built with brick, as ftone is found not by any means fo favourable to the maturation of the fruit, and far more inconvenient in the nailing of the trees. The manner of conftructing hot-walls for bringing fruit forward by artificial heat will be defcribed hereafter. See Hot-Wall.

Where fituations cannot be provided with convenience without the walls of the garden for the whole of the forcing apparatus, the pits and hot-beds may be placed in funk areas in the quarters of the gardens as near as convenient to the hot-houfes.

Copings.—Some advife projecting copings of ftone or wood to be fixed upon the tops of the walls, and the author of the "Philofophy of Gardening" conceives that they may be of great utility in the early vernal months in preventing the tender young fhoots of fruit-trees from being deftroyed

deſtroyed by froſt, as, from their being leſs imbued with the night-dews in conſequence of them, they will be leſs expoſed to danger from that cauſe; it being well aſcertained that the fine ſhoots of vegetables are moſt expoſed to the deſtruction of froſt when in a moiſt ſtate.

But Mr. Forſyth does not however approve of ſuch fixed copings, eſpecially when they project ſo far as is uſually the caſe; moveable wooden ones faſtened by iron hooks to pieces of wood built into the tops of the walls being in his opinion preferable. Beſides, they are uſeful to fix nettings, &c. to in the early ſpring, for protecting the trees. When fixed copings are adopted, they ſhould not, he thinks, extend above an inch on each ſide of the wall, as the ſlight projection will be ſufficient to preſerve it, and at the ſame time not prevent the dews and rains from falling upon the upper parts of the trees, by which they are greatly benefited. Copings are ſometimes formed of a ſort of brick made convex on the ſide which is upwards; but theſe are expenſive. A ſort of ſlate brought from Wales has lately been made uſe of for this purpoſe, which ſeems to anſwer very well. It is made to have the projection juſt mentioned. This ſort of coping has been employed in the extenſive gardens at Aſhted park, near Epſom, and may be had of different ſizes at Mr. Samuel Wyatt's ſlate-wharf near Blackfriars' bridge, London. Mr. Forſyth ſuggeſts that common copings ſhould have a little ſlope given them "towards the north or eaſt, according to the aſpect of the wall," by which the wet from the ſouth and weſt ſides may be taken away, and the danger of the early bloſſoms and fruit being injured on the ſouth and weſt walls in cold nights be avoided.

Drains.—Where the ſoil of a garden is naturally of a ſtiff retentive quality, and retentive of moiſture, proper under-draining will be eſſentially neceſſary in order to the production of good well taſted fruit, as well as fine culinary vegetables. In theſe caſes the main or leading drains ſhould be made under the walks, and thoſe from the quarters be formed to communicate with, and empty themſelves into them. They ſhould be conſtructed of bricks, either common or ſuch as are formed for the purpoſe, and be laid in ſuch directions as are the beſt adapted to the removal of the injurious wetneſs, and always of ſuch depths as to prevent their being injured by the ſpade in working the ground. By this means the ſoil will be kept in a ſuitable ſtate for the growth of the plants, and the walks preſerved in a fine ſtate of dryneſs, ſo as to be ſufficiently firm for carting or wheeling upon, even in wet ſeaſons.

Where the ground deſtined for the purpoſe of forcing is on a level conſiderably lower than that of the garden, the water from the latter may be made to ſupply the former, by having the main leading drain terminating in a tank, pond, or ciſtern conſtructed in it for the purpoſe, which in many ſituations may be extremely convenient and uſeful.

In many caſes, and eſpecially where the garden grounds are of a dry quality, it is of vaſt advantage to have them ſituated contiguous to rivers, brooks, or large baſons of water, from which they can be ſupplied by means of drains, pipes, or other contrivances, in the moſt hot and droughty ſeaſons of the year.

But where no ſupplies of water can be provided and brought to the garden in theſe ways, Mr. Forſyth ſuggeſts that where they lie on the ſides of public or other roads, and the level of the ground is ſuitable, hollow drains ſhould be formed in the moſt convenient parts, to receive the water that waſhes them in rainy ſeaſons, and convey it to large ponds or other places made for its reception in the higheſt part of the garden ground that will admit of it, from which it may be diſperſed to the different quarters that will allow of it by pipes, with cocks fixed at different places for turning it on, as may be neceſſary. Or, by having ſuitable channels cut, it may be turned upon different parts, as in the practice of watering meadow land, which, where the roads are repaired with calcareous materials, or there is much vegetable matter waſhed down them, may be highly beneficial in the way of manure. A proper ready exit for the ſuperabundant water muſt always be provided in theſe caſes, to prevent ſtagnation. And where the ground has been much enriched by ſtable manure, the practice ſhould be cautiouſly adopted, as more fertility may be conveyed away in the ſtate of ſolution than is brought by the water. The moſt convenient time for turning on water is generally during the night, which in dry ſeaſons is the moſt advantageous to the plants or crops that are upon the ground.

The expence in pipes, drains, channels, and other apparatus for theſe purpoſes, will be conſiderable at firſt; but the ſaving in labour, and time, in pumping and carrying water, it is conceived, will ſoon repay it. Where water is under the neceſſity of being pumped up from deep wells, large baſons or reſervoirs ſhould be provided, in which it ſhould remain ſome time expoſed to the influence of the atmoſphere, before it is made uſe of in the above or any other way in gardens.

Where garden grounds are of a wet ſpewy quality, Mr. Forſyth recommends baſons to be formed in the moſt convenient parts of them, for the reception of the water that proceeds from the drains, and which falls in rain on the walks and paths, as well as other parts.

Forming new Gardens.—In forming new kitchen garden grounds, where the ſoil is of a ſtrong, ſtiff, heavy quality, they ſhould be ploughed or trenched over three or four times, being expoſed to the effects of froſt, in pretty high ridges, for a winter, in order to bring them into a proper condition before the crops are put in. A crop of potatoes or beans alſo aſſiſts greatly in bringing them into a proper ſtate of pulverization for being planted upon with culinary vegetables.

When the land is become ſufficiently broken down and reduced, the wall and other trees, as well as different ſorts of vegetable crops, may be put in. Some, however, put the fruit-trees in before this has been accompliſhed; but it is not a good practice, as they are liable to be injured by the digging which afterwards becomes neceſſary in preparing the ſoil in a proper manner.

In planting wall-trees they ſhould be ſet at different diſtances according to the kinds: thoſe of the peach, nectarine, apricot, plum, and cherry deſcriptions at fifteen, eighteen, or more feet, and for figs and pears twenty are ſeldom too much, ſuitable aſpects being choſen according to the kinds. Between their wall-fruit trees, ſome at firſt introduce half or full ſtandards, that the walls may at once be covered, removing them afterwards. But this is a method that ſhould never be attempted where it can be avoided, as being very diſadvantageous. Trees of the eſpalier kind are likewiſe frequently introduced in ranges round the main quarters at the diſtance of about ſix feet from the ſide of the walk, and from fifteen to twenty in the rows, according to the ſorts that are made uſe of. Within theſe ranges of eſpalier trees, good

good ſtandards of tall growth are occaſionally introduced at the diſtance of thirty, forty, or more feet in each direction. Where there are orchards this ſhould, however, always be avoided as much as poſſible.

Fruit-trees of the ſmall ſhrubby kinds, ſuch as gooſeberries, currants, raſpberries, &c. where there are not outſlips, are frequently introduced on the ſides of the quarters, and as diviſions to them when large, at the diſtance of eight or nine feet from each other. When planted in this way, they ſhould be trained in the fan form. But it is better, where it can be done, to have them in ſeparate plantations, eſpecially the firſt ſort.

Cropping.—In reſpect to the diſtribution of the vegetable crops, it muſt be regulated by the nature of the ſituation, their particular kinds, as well as the taſte and experience of the gardener. On the narrow borders under the wall-trees various ſorts of ſmall crops may be grown, both of the early and late kinds, according to the difference of the aſpects; but all the deep rooting ſorts ſhould be avoided, ſuch as cabbages, cauliflowers, beans, peaſe, except thoſe of the frame kind, as being injurious to the trees by the ſhade which they cauſe, as well as by depriving them of due nouriſhment.

But the large parts of the borders next the walks are proper for raiſing all ſorts of the more early crops, ſuch as thoſe of the raddiſh, lettuce, ſpinach, carrots, French beans, ſallad herbs, and all the dwarf pea kinds that are cultivated in wide rows; thoſe which have a ſouthern aſpect for the earlieſt crops; and the eaſtern and weſtern ones for ſucceſſion crops of the ſeveral kinds; and the northern ones, as being more cool, for raiſing and pricking out many ſorts of ſmall plants, ſlips, and cuttings in the ſummer ſeaſon, when the other parts are apt to be too dry and too much expoſed to the heat of the ſun.

All ſuch borders as are next to the ranges of eſpalier trees are well ſuited to the different low growing crops, ſuch as lettuce, ſpinach, endive, ſtraw-berries, &c. and for pricking out upon, at different ſeaſons, many ſorts of plants to be afterwards tranſplanted into different ſituations, in order to complete their growth.

But the quarters or large diviſions ſhould always be deſtined for the reception of the large principal crops, ſuch as thoſe of the onion, leek, carrot, parſnip, turnip, beet, potatoe, cabbage, cauliflower, brocoli, colewort, kale, pea, bean, ſcarlet-bean, celery, artichoke, aſparagus, and other ſimilar kinds.

The preparation of the ground, the methods of manuring, and putting in the crops, with their modes of after-culture and management, are fully explained under their reſpective general heads.

In every department the greateſt attention ſhould be paid to the keeping of the different parts fully cropped, as well as to neatneſs and regular order; and as the crops are removed from the ground in the autumn, it is often of great advantage to have it ridged up for the winter in a regular manner

Where the garden has been thus laid out, planted, and finiſhed, Mr. Forſyth has found much advantage from having a plan of it, with the names of the different trees introduced in their proper places. By this means the memory is greatly aſſiſted, eſpecially in extenſive grounds, and the various operations performed with more regularity and exactneſs.

Mr. London adviſes that in complete reſidences the kitchen garden ſhould be laid out at firſt, and directed afterwards ſolely in the view of cultivating and producing culinary fruits and vegetables. Little or nothing of the ornamental kind ſhould be introduced, but utility every where predominate. Even the edgings of the walks ſhould be planted in moſt caſes with uſeful plants, ſuch as ſtraw-berries, parſley, &c.

The flower garden, green-houſe, plant-ſtoves, &c. ſhould be entirely by themſelves, though they are often intermixed with the others in leſs complete reſidences.

The plans of gardens may be varied very conſiderably according to the nature, ſituations, and other circumſtances of the places where they are to be formed; but that which is repreſented in the correſponding plate, ſeems to poſſeſs moſt of the advantages that have been introduced by modern improvements in the art of gardening.

Robbing gardens and orchards of fruit growing in them, ſtealing underwoods and hedges, and ſtealing or deſtroying any turnips, potatoes, or the roots of madder, when growing, are puniſhable criminally, by whipping, ſmall fines, impriſonment, and ſatisfaction to the party wronged, according to the nature of the offence, by the ſtatutes 43 Eliz. cap. 7. 15 Car. II. cap. 2. 23 Geo. II. cap. 26. and 31 Geo. II. cap 35. And by ſtat. 6 Geo. III. cap 36. and cap. 48. and 13 Geo. III. cap. 33. the ſtealing by night of any trees, or of any roots, ſhrubs, or plants to the value of 5*s.* is made felony in the principals, aiders, and abettors; and in the purchaſers, knowing the ſame to be ſtolen; and the ſtealing of any timber trees, as oak, beech, cheſnut, wallnut, aſh, elm, cedar, fir, aſp, lime, ſycamore, and birch, and of any root, ſhrub, or plant, by day or night, is liable to pecuniary penalties, for the two firſt offences, and for the third is a felony, liable to tranſportation for ſeven years.

GARDEN *Engine*, a contrivance of the pump kind, deſigned for the purpoſe of watering different ſorts of wall and other trees, ſhrubs, &c. Engines have likewiſe been invented for ſteaming hot-houſes, melon-pits, &c. in order to obviate the effects of the red-ſpider, &c.

GARDEN, *Floating*, a ſort of garden employed by the Mexicans, according to the account given by the Abbè Clavigero, in the lake of that name, on their being brought under the dominion of the Colhuan and Zepanecan nations. Induced by neceſſity and the deſire of benefit, they had recourſe to the forming of a kind of moveable or floating gardens, by plaiting and twiſting the branches of willows, and other marſh or aquatic plants that are light, together. Upon this baſis they firſt place the light bruſhwood that floats on the lake to ſome thickneſs, then over the whole the earth, mud, and dirt that are got up from the bottom of the lake. The figure in which theſe gardens are made, is regularly quadrangular, but varying in the length and breadth, though commonly about eight poles long, with not more than three in breadth, having only about a foot above the ſurface of the water. Theſe were, it is ſaid, the firſt portions of ground that theſe people cultivated after the founding of the city of Mexico. In theſe they firſt raiſed the maize, great pepper, and other plants the moſt neceſſary to their ſupport. Gradually as they became more numerous, from the exertions of the labourers, odoriferous and other plants, deſtined to the uſes of ſuperſtition and luxury, were introduced into them; and they are at preſent appropriated to the culture of moſt ſorts of garden plants and flowers. The abundant produce of theſe prolific gardens are brought daily by the canal in numerous ſmall veſſels, at ſun-riſe, to the great market-place of the capital to be ſold. The plants thrive in theſe ſituations in an aſtoniſhing manner; the mud of the lake being extremely fertile and productive, without the aid of rain. A ſmall tree and hut commonly ſhelter the cultivators of the larger ſorts of theſe gardens from the effects of rain and heat. Whenever the owners of theſe gar-

dens are inclined to change their situations, they get into their little vessels, and by their own strength alone, or, where that is not sufficient, by the assistance of others, they get them afloat, and tow them after them wherever they please. This floating garden scene is highly curious and interesting, so as to form a place of great recreation and amusement.

Garden-*Frame*, a kind of frame employed in gardens for forcing different sorts of vegetables, &c. See Frame, and Forcing-*Frame*.

Garden, *Hanging*, a sort of ancient garden, which is said to have been formed in a raised manner, on arches, by Nebuchadnezzar king of Babylon, with the view of gratifying his wife Amyctis, who was the daughter of Astyages, king of Media. These gardens are supposed by Quintus Curtius to have been equal in height to the city, which is fifty feet. They contained on every side a square of four hundred feet, and were carried up in several terraces, surmounting each other, to which there were ascents by different flights of stairs or steps, that had ten feet in width. The arches that sustained the whole of this pile were raised above each other, being strengthened by a wall on every side of above seven yards in thickness. The floors of the several terraces were laid first with large flat stones of considerable lengths and breadths, over which was placed a stratum of reed mixed very fully with bitumen, then two rows of bricks closely cemented together with mortar, and the whole afterwards covered with thick sheet lead, upon which the mould of the garden was deposited, to such a depth as to admit large trees to take root and establish themselves in it. Trees, plants, and flowers of various kinds were introduced into these gardens.

The upper terrace was likewise provided with an aqueduct or engine, by which the water was drawn up from the river, and dispersed over the whole of the gardens when necessary.

Some have condemned these gardens as unnatural, while others have considered them as deserving of a portion of praise; but whatever merit may have been allowed them, they could certainly never have any thing of the natural or rural character about them. See Pensiles *Horti*.

Garden-*Implements*, the different sorts of tools that are employed in performing the work of gardening. These are of several kinds, as spades, hoes, rakes, shears, knives, saws, rollers, &c. as may be seen in the annexed plate.

Garden-*Roller*, such as is made use of in gardening. They are of two kinds, as wood and iron; the former is the most useful upon grass, but the latter where gravel is to be rolled down. See Roller.

Garden *Sheds*, such as are necessary in gardens for containing tools, flower-pots, hot-bed frames, glass-sashes, and for working in during rain or bad weather. They are best placed on the back side of the hot-house, by which means they may be made to hold the furnaces, fuel, and many other articles.

Garden *Traps*, a sort of strong iron traps of considerable size, constructed for the purpose of being placed in such garden grounds as are much exposed to the nocturnal depredations of robbers. They are capable of securing a strong man, as they act with prodigious power. They are usually placed so as to be quite concealed. The form in which they are made is, in general, somewhat that of the common rat-trap. Wherever traps of this kind are set, it is necessary to have a notice fixed up.

There are several other sorts of traps employed in gardens for taking mice and other kinds of vermin, &c. See Vermin.

Garden *Bay*, in *Geography*, a bay on the east coast of Newfoundland. N. lat. 49° 42'. W. long. 54° 50'.

Garden *Islands*, a cluster of small islands in the Pacific ocean. N. lat. 21° 45'. W. long. 146° 20'.

Garden-*snail*, in *Conchology*. See Helix *hortensis*.

GARDENER, a person who has the care and management of a garden. A complete gardener should, besides the cultivation of all sorts of culinary vegetables, be perfectly acquainted with the different operations of pruning, training, budding, grafting, and layering, as well as those of raising and forcing all sorts of plants, fruits, roots, &c. It is only in this way that he can be fully qualified for his employment. It is very seldom, however, that the common gardener is much informed in respect to the higher branches of the art. The business of the gardener requires a continual care and attention to the different objects, and of course much steadiness in the person who has the direction of it.

GARDENIA, in *Botany*, so named by Ellis in honour of his able friend and correspondent Dr. Alexander Garden, F.R.S.: see that article.—Linn. Gen. 116. Schreb. 162. Willd. Sp. Pl. v. 1. 1225. Thunb. Diss. Bot. 1. Ait. Hort. Kew. v. 1. 293. Mart. Mill. Dict. v. 2. Juss. 201. Lamarck Illustr t. 158. Gærtn. v. 1. 140. t. 28. f. 4, *Cerifcus*. (Genipa; Plum. Ic. t. 136. Linn. Gen. 96. Schreb. 136. Juss. 201. Tourn. t. 436, 437. Randia; Linn. Gen. 85. Schreb 111. Juss. 199. Gærtn. t. 26. Browne Jam. 143. t. 8. f. 1. Lamarck Illustr. t. 156. Mussænda; Jacq. Amer. 69. t. 48, 49.)—Class and order, *Pentandria Monogynia*. Nat. Ord. *Contortæ*, Linn. *Rubiaceæ*, Juss.

Gen. Ch. *Cal.* Perianth superior, of one leaf, in about five, more or less deep, upright, vertical, permanent segments. *Cor.* of one petal, funnel-shaped; tube cylindrical, longer than the calyx; limb spreading, in five, rarely more, deep, oblique or contorted segments. *Stam.* Filaments none; anthers five, linear, striated, sessile in the mouth of the tube, and half as long as the limb. *Pist.* Germen inferior; style slightly club-shaped, as long as the tube; stigma prominent, obovate, obtuse, lobed or furrowed. *Peric.* Berry coated, of from one to four cells. *Seeds* imbedded in pulp, numerous, depressed, imbricated.

Ess. Ch. Corolla of one petal, contorted. Berry coated, inferior, with many seeds. Stigma lobed. Anthers sessile in the mouth of the tube. Segments of the calyx vertical.

Obs. The most natural number in the parts of the flower is five; but in some species it varies, as Thunberg remarks, as far as nine in the anthers, as likewise in the divisions of the corolla and calyx. The sessile anthers, and the twisted or vertical segments of the calyx, form the most important characters, especially the first. Linnæus, from the shape and direction of the segments of the corolla, particularly in his original species, referred this genus to the natural order of *Contortæ*, but Jussieu more properly reduces it to his own *Rubiaceæ*, an order whose limits and characters were not fully known to Linnæus, and which perhaps requires subdivision. *Genipa*, adopted by Linnæus from Plumier and Tournefort, is generally agreed to be a real *Gardenia*, notwithstanding the very slight segments or teeth of its calyx; but that name, though of prior origin, is of barbarous derivation, and even Lamarck has agreed to sink it in the well-merited *Gardenia*. The stamens of *Genipa* in Plumier's figure, copied by Tournefort and Lamarck, are erroneously represented. *Randia* is also a prior name to *Gardenia*, but we are by no means inclined to prefer it, independently of the great inconvenience of such a change; nor are we sure that *Randia* ought not to remain by itself, on account of the seemingly horizontal calyx-teeth.

The original idea and characters of this genus, are taken from

from G. *florida*, Linn. Sp. Pl. 305, commonly called the Cape Jasmine. This was first brought to England by a Captain Hutchinson, who, about the middle of the last century, met with a bush of it in full flower, somewhere near the Cape of Good Hope, probably in a cultivated state. He brought the whole plant in a pot to England, and it was preserved in the collection of Mr. Warner, a great cultivator of exotics. Mr. Gordon the nurseryman having obtained layers from this tree, propagated it so successfully that he is said to have gained more than 500*l.* by the produce. It is now frequent in gardens, treated as a stove plant, though it chiefly requires great heat in the early spring, to make it bloom, being at other times a hardy greenhouse plant. The flowers with us are always double, like those of the original shrub brought by Captain Hutchinson, with only imperfect traces of anthers; but many specimens with single flowers have been brought from the East Indies, in several parts of which it grows wild, as well as in China and Japan. Miller and Ehret published figures of this beautiful shrub as a Jasmine; but the more intelligent Ellis determined it to be a new genus, and published its characters with a plate in the Philosophical Transactions, v. 51. The *stem* is shrubby, three or four feet high, much branched, spreading. *Leaves* opposite, on short stalks, elliptical, various in breadth, bluntly pointed, entire, smooth, veiny, evergreen. *Stipulas* sheathing, intrafoliaceous, obtuse. *Flowers* solitary, terminal, stalked, of the size and aspect of a double *Narcissus poeticus*, with a sweet and very powerful scent, resembling the flavour of ginger. They turn buff as they fade.

The South-sea plant, used by the inhabitants of those islands to adorn their hair, appears to be a distinct species, as far as we can judge from an unpublished plate communicated by sir Joseph Banks to several of his friends. The segments of its corolla are much narrower, the tube longer, and the leaves more obovate. Yet this plate is announced by Thunberg, in the 18th page of his dissertation, as G. *florida.*

G. *radicans*, Thunb. Diss t. 1. f. 1, a native of Japan, where it was first observed by Kœmpfer, is another genuine *Gardenia*. It is of more humble, decumbent or creeping growth, and smaller in every part, but otherwise much like the *florida*. We have seen it alive at Messrs. Lee and Kennedy's, Hammersmith.

G. *Thunbergia*, Linn. Suppl. 162, (*Thunbergia capensis* of Montin in the Stockholm Trans. for 1773,) is one of the finest and most indubitable species, a native of the Cape of Good Hope. Though frequent in our stoves it rarely blossoms. See Curt. Mag. t. 1004. The calyx in this bursts obliquely. The segments of the corolla are usually eight or nine, with as many anthers.

The *Mussænda formosa*, and *M. spinosa* of Jacquin above cited, very different in genus from the original *Mussænda* of Hermann, Linnæus, and others, are very justly reduced to *Gardenia.*

We have several certain species besides from the East Indies, with more that are doubtful. *Rothmannia* probably ought to be kept distinct, as Mr. Salisbury has judged. See Parad. Lond. t. 65; and Curt. Mag. t. 690.

Gardenia, in *Gardening*, contains plants of the flowering shrubby kind for the stove; of which the species cultivated are the fragrant Gardenia or Cape jasmine (G. florida); and the round-leaved Gardenia (G. aculeata); of which the first sort varies with single and double flowers.

Method of Culture.—In the first sort it may be effected by planting cuttings of the young shoots in pots of light rich mould in the summer season, plunging them in a moderate tan hot-bed, and covering them close with bell-glasses, giving due shade till they have stricken root. When this has been fully effected, they should be carefully removed into separate small pots, and replunged in the hot-bed. When they are become well established, they should be gradually inured to the influence of the air. And the second sort may be raised by sowing the seeds in pots filled with light fresh earth in the early spring months, plunging them in a bark hot-bed, frequent slight waterings being given. After the plants come up, they should have free air in fine weather, and be often watered. When of some growth they should be carefully removed into separate pots, and be placed in the hot-bed, due shade being given till they are rooted, when they must have air and water in proportion to the warmth of the season. As the autumn approaches they should be removed into the bark-bed of the stove, where they are best kept the two first seasons; but they may afterwards be exposed in the open air in the hot summer months.

All these plants are useful for the variety which they afford in collections of stove plants, and have a fine effect amongst them.

GARDENING, the art of forming, planting, cultivating, and managing garden grounds, whether of the ornamental or culinary kinds. In a more enlarged sense, it is the business of rendering the rural objects of nature more agreeable, interesting, and useful to mankind; in the execution of which the operator has the whole range of country scenery at his command, in order to select with taste such parts as are the most appropriate and suitable to his particular views and purposes.

Gardening is one of those arts that must obviously, from the necessities of mankind, have been practised at a very early period, so far at least as herbs and fruits are concerned. It seems not improbable but that it almost immediately succeeded the forming of distinct habitations, and the possession of individual property. It must, however, have remained long after its introduction in a very rude and imperfect state, as, notwithstanding the accounts that have been given of the magnificent gardens of early times, the Greeks and Romans seem to have been but little acquainted with them; for the garden of Alcinous, when divested of the beautiful language of the poet, appears to have been nothing but a sort of orchard and vineyard somewhat adorned with the prevailing works of art; or those of Lucullus, Cicero, and Pliny, among the Romans, any thing more than mere places of retreat, planted with various odoriferous flowers and shrubs, and embellished with a variety of heavy unnatural works of ornament. This taste in gardening would seem to have continued until the introduction of the Dutch system by London and Wise, and the establishment of that of the cutting, clipping, and shearing plan by Brown, and indeed to have been partially combined with these for some time afterwards by Repton and others of the same school; though the genius of Milton had long before foreseen and suggested the impropriety of employing such absurd and fantastic ornaments. The shearing of yew, box, and holly into figures of various kinds, and the shaving of river-banks, lawns, &c. however, went on until their absurdity rendered them perfectly contemptible, and caused a better and more natural taste. The keen and spirited strictures of Mr. Knight on the folly of this practice are too just and interesting to be omitted:

"Shaved to the brink, our brooks are taught to flow
Where no obtruding leaves or branches grow;
While clumps of shrubs bespot each winding vale,
Open alike to every gleam and gale;

Each ſecret haunt, and deep receſs diſplay'd,
And intricacy baniſh'd with its ſhade.
"Hence, hence! thou haggard fiend, however call'd,
Thin meagre genius of the bare and bald;
Thy ſpade and mattock here at length lay down,
And follow to the tomb thy favourite Brown:
Thy favourite Brown, whoſe innovating hand
Firſt dealt thy curſes o'er this fertile land;
Firſt taught the walk in ſpiral forms to move,
And from their haunts the ſecret Dryads drove;
With clumps beſpotted o'er the mountain ſide,
And bade the ſtream 'twixt banks cloſe ſhaven glide;
Baniſh'd the thickets of high tow'ring wood
Which hung, reflected, o'er the glaſſy flood."
Landſcape, p. 25. ed. 2.

Verdant ſculpture, and that regular preciſion that marked the views of the preceding period, were now, however, wholly laid aſide, and more chaſte deſigns ſubſtituted in their places. Bridgman became at this time a leading deſigner, who, diſdaining the trammels of his predeceſſors, extended the plans, and rejected the notions of forming the different diviſions of the garden ſo as to tally with their oppoſites, which were common before. And though it muſt be confeſſed that he retained an attachment to ſtraight walks and high clipped hedges, it was only as a ſort of great outline, the reſt being diverſified by trees variouſly diſpoſed, ſo as to produce the moſt natural effects. Other uſeful improvements were alſo gradually introduced as he became more freed from the fetters of the age that had preceded him. But the circumſtance that led to the principal improvements that immediately ſucceeded, was the diſcovery of the means of avoiding the neceſſity of walls as boundaries, in the forming of ſunk-fences, called *ha ha's* by the common people, as expreſſive of ſurprize at being imperceptibly ſtopped in their progreſs. This mode of fencing had ſcarcely been introduced before the practices of levelling, rolling, mowing, &c. ſucceeded it. According to ſir William Temple, the adjoining ground of the park on the outſide of the ſunk-fence was to be in ſome meaſure made to harmonize with the ſhort graſſed lawn on the inſide; and the garden, in its turn, to be ſet free from its prim regularity, in order to aſſort with the more wild country without. "The ſunk-fence aſcertained the ſpecific garden; but that it might not draw too obvious a line of diſtinction between the neat and the rude, the contiguous out-lying parts came to be included in a kind of general deſign; and when nature was taken into the plan, under improvements, every ſtep that was made, he conceives, pointed out new beauties, and inſpired new ideas."

Things were in this ſtate when Kent appeared, who, Mr. Walpole, in his hiſtory of gardening, ſubjoined to the "Anecdotes of Painting," ſays, was "painter enough to taſte the charms of landſcape, bold and opinionative enough to dare and to dictate, and born with a genius to ſtrike out a great ſyſtem from the twilight of imperfect eſſays. He leaped the fence, and ſaw that all nature was a garden. He felt the delicious contraſt of hill and valley changing imperceptibly into each other, taſted the beauty of the gentle ſwell or concave ſcoop, and remarked how looſe groves crowned an eaſy eminence with happy ornament; and, while they called in the diſtant view between their graceful ſtems, removed and extended the perſpective by deluſive compariſon. Thus," continues he, "the pencil of his imagination beſtowed all the arts of landſcape on the ſcenes he handled. The great principles on which he worked were perſpective, and light and ſhade. Groups of trees broke too uniform or too extenſive a lawn; evergreens and woods were oppoſed to the glare of the champaign; and, where the view was leſs fortunate, or ſo much expoſed as to be beheld at once, he blotted out ſome parts by thick ſhades, to divide into variety, or to make the richeſt ſcene more enchanting, by reſerving it to a further advance of the ſpectator's ſtep. Thus, ſelecting favourite objects, and veiling deformities by ſcreens of plantation, ſometimes allowing the rudeſt waſte to add its foil to the richeſt theatre, he realized the compoſitions of the greateſt maſters in painting. Where objects were wanting to animate his horizon, his taſte as an architect could beſtow immediate termination. His buildings, his ſeats, his temples, were more the works of his pencil than his compaſſes. We owe," Mr. Walpole conceives, "the reſtoration of Greece and the diffuſion of architecture to his ſkill in landſcape."

His management of water was admirable, and calculated to introduce innumerable beauties on the face of nature. He bade adieu to all the ſtiff formal modes of canals, circular baſins, and caſcades tumbling down marble ſteps, "that laſt abſurd magnificence of Italian and French villas;" nor was the forced elevation of cataracts any more viſible. The placid ſtream was now directed to move in a ſerpentine courſe, apparently, in a natural manner, being concealed by properly interſperſed thickets, where interrupted by the difference of levels, ſo as to ſhew itſelf again in its gliſtening progreſs at ſome naturally expected diſtance. The borders were indeed ſmoothed, but all their features of waving irregularity effectually preſerved. The edges of the banks were occaſionally ſtudded with trees, to remove their ſameneſs; and, where its meandering courſe diſappeared among hills, ſhades deſcending from the heights inclined towards its progreſs, and framed the diſtant point of light under which it was loſt in turning in either direction.

Dealing, in this way, in none but the true colours of nature, and ſeizing upon its moſt intereſting features, a new creation was gradually preſented to the man of taſte. "The living landſcape," ſays Mr. Walpole, "was chaſtened or poliſhed, not transformed. Freedom was given to the forms of trees; they extended their branches unreſtricted; and where any eminent oak, or maſter beech, had eſcaped maiming, and ſurvived the foreſt, the buſh and bramble were removed, and all its honours were reſtored to diſtinguiſh and ſhade the plain. Where the united plumage of an ancient wood extended wide its undulating canopy, and ſtood venerable in darkneſs, Kent thinned the foremoſt ranks, and left but ſo many detached and ſcattered trees as ſoftened the approach of gloom, and blended a chequered light with the thus lengthened ſhadows of the remaining columns." But, with all his merit, Kent had many faults and imperfections; he frequently left the houſes too naked and expoſed; having followed and imitated nature with ſo much happineſs and ſucceſs, he knew not where to ſtop, but often puſhed his reformations much further than was juſtified by correct principles and true taſte.

Theſe defects have not only been corrected and improved, but a new and maſterly finiſhing applied by the taſte and genius of ſubſequent profeſſors, among whom may be ranked the names of Price, Knight, London, &c. The ſtrenuous and ſucceſsful attempts of ſome of the earlier deſigners, with thoſe of more modern times, have indeed not merely given a ſort of currency to a variety of improvements in the art of ornamental gardening, but introduced a much more natural and picturesque ſyſtem, and greatly contributed to the expulſion of the ſtiff formal practice of the Dutch ſchool, as well as that of Brown and his followers of more recent periods, the abettors of what they term "landſcape gardening." This is beautifully ſhewn in the lines below, which were left written on a ſeat

ſeat at Havod, the elegant reſidence of Thomas Johnes, eſq. Cardiganſhire.

> "Far hence! let Repton, Brown, and Eames
> Zig-zag their walks, and torture ſtreams;
> But let them not my dells profane,
> Or violate my Naïad train;
> Nor let their arrogance invade
> My meaneſt Dryad's ſecret ſhade,
> And with fantaſtic knots diſgrace
> The native honours of the place;
> Making the vet'ran oak give way,
> Some ſpruce exotic to diſplay.
> Their petty labours be defy'd
> Who *taſte* and *nature* would divide."

Much effect has been produced in the richneſs and variety of our rural ſcenery by the gradual introduction of foreign trees, ſhrubs, and plants by different individuals, within the laſt half century, ſuch as thoſe of the fir, pine, larch, and others of ſimilar growth, and likewiſe the great number of tall, hardy, bold, and varied-leaved vegetables, natives of different countries and climates. The beauty and diverſity of colouring afforded in this way, in ſome inſtances, are highly curious and intereſting, but conſiderable taſte and attention are requiſite to introduce them with propriety, and ſo as to produce the beſt and moſt ſtriking appearances.

The improvers of culinary gardening have not been fewer in number, or leſs diſtinguiſhed by the utility and importance of their diſcoveries and improvements, than thoſe of the ornamental claſs. The more early gardeners of this kind ſeem, however, to have been much confined by the rules and abſurd reſtrictions of the art, and to have moved in but a very narrow ſpace. They only knew the proper methods of raiſing and cultivating a very limited number of herbs, roots, and plants, and theſe often in very imperfect ſtates. In this country the Dutch practice continued to remain for a great length of time, probably nearly to the period at which gardening became reduced into a much more regular order by the exertions of Miller and thoſe who immediately ſucceeded him; ſince which time it has continued to advance with more accelerated progreſs, and received the aid of much ſcientific improvement. The number of plants, herbs, roots, and fruits, cultivated here, have been greatly increaſed, and better methods of managing them introduced. The machinery of the art has been formed on more juſt and convenient principles, and the neceſſary buildings erected with more ſcientific views. In theſe intentions the writings of Speechly, Nicol, Anderſon, Forſyth, Knight, London, &c. as well as the publications of the writers of calendars, have been of conſiderable utility. It has, however, been lately aſſerted by an able writer, "that there ſcarce exiſts a ſingle ſpecies of eſculent plant or fruit, which (relative to the uſe of man) has yet attained its utmoſt ſtate of perfection: nor any branch of practical horticulture which is not ſtill ſuſceptible of eſſential improvement."

The late eſtabliſhment of a Horticultural Society in London is a circumſtance that promiſes much advantage to the art, and neceſſarily holds out more extenſive and beneficial improvements in its different departments.

This may be more confidently looked for, ſince the efforts of ſmall provincial aſſociations have been ſo particularly ſucceſsful in this way. In Lancaſhire the culture of the gooſeberry and onion have been thus carried to ſtates of perfection that are wholly unknown to the more ſouthern diſtricts of the kingdom. And it is not improbable but that the ſame thing may have happened in other ſituations from ſimilar cauſes.

Ornamental and *Culinary Gardening* have now indeed been brought to a ſtate of improvement in this kingdom that certainly render them deſerving of no mean rank among the liberal arts, though the former takes in a much wider range, and embraces a much greater number of objects than the latter.

Principles and Materials of Ornamental Gardening.—The principles and objects of *ornamental gardening* are principally thoſe of improving and rendering the ſcenes of nature more amuſing and agreeable by the application of correct taſte, and the judicious management of the different materials that are employed, which is effected by ſelecting, arranging, combining, diſpoſing, and exhibiting them in different ways, according to the nature of the places and other circumſtances. It may, in ſome meaſure, be diſtinguiſhed into pleaſure or flower gardening, the culture of wild plants and flowers, and the management of flowering plants of the ſhrub kind.

The materials of the art may be chiefly conſidered to be thoſe of lawn, ſand, gravel, ſoil, water, ſtones, rocks, woods, trees, ſhrubs, and flowers. There are a few others alſo that may be occaſionally made uſe of in this ſort of gardening, but they require much caution in their introduction. Theſe are moſtly of the ſtatue, inſcription, and other ſimilar kinds; buildings, ſeats, archways, &c.

Where ſingle objects are diſplayed, they are generally intended to ſhow ſome of the minor beauties, ſuch as thoſe of the flower or fruit kinds, and are, conſequently, placed in the moſt conſpicuous parts, and in ſuch modes as muſt neceſſarily excite attention in thoſe who may paſs. This is, perhaps, the loweſt branch of this department of gardening, and may have a reference to the nature, mode of growth, and form of the plants, as well as to the fruits and the ſhades of the foliage: ſometimes alſo to the whole in combination.

Another principle of this ſpecies of gardening is that of exhibiting beauties in a congregated, or collective manner, which is accompliſhed either by means of *arrangement*, or what is termed *grouping*.

Mr. London, in his uſeful treatiſe on "Country Reſidences," offers numerous juſt and intereſting remarks upon theſe different methods. Arrangement, he conceives, capable of being effected either "upon the principles of botany, of culture, of general nature, or artificial borderings." The firſt of which may be as various as the different ſyſtems which have been invented by botaniſts, whether natural or artificial, and "is employed in botanic gardens, or collections either of trees or plants." The ſecond mode "refers chiefly to ſuch plants or trees as require a particular attention with regard to ſoil, climate, &c." It includes "all the bulbous-rooted flowers, tender herbaceous plants, American plants and trees, and, in ſome inſtances, exotics," eſpecially "the firſt claſs, which are always, when in a cultivated ſtate, guided by it, as in Dutch parterres, &c." But he thinks "the arrangement univerſal in nature, is what will be moſt pleaſing to general admirers." Its principles are perfectly ſimple; being nothing more than this, "that one kind of objects, beauties, or characters, always prevails in one place: and that when another ſucceeds, it is generally done in a gradual manner, the interval between them being compoſed of characters, or beauties, irregularly blended together; which is beautifully illuſtrated throughout all nature, whether animal, vegetable, or mineral." It is, however, aſſerted to be a method that "has hitherto been totally neglected, as moſt of nature's laws have been in this branch of ſcience; while in its place is ſubſtituted, by cuſtom and ignorance, a mode of arrangement totally inconſiſtent with nature or good taſte," that of "the vulgar mode of mixing

different

different species together indiscriminately; not only without the smallest regard to connection or difference of character, but in studied opposition to it," as is seen in numerous instances of green-houses, flower-gardens, shrubberies, and general planting. This is a principle the most generally applicable in this sort of gardening, Mr. London thinks, "whether we regard their general distribution into lawn, flowers, and shrubs; or the smaller parts, composed of flowers, or shrubs only." And it is maintained that, "even a collection of beauties, exhibited singly, may still be contrived agreeable to this principle. Thus, in a plot of finely varied auriculas, each minute variety may be kept by itself, and the same often (though not always) in beds of tulips, hyacinths, and ranunculuses."

Grouping, it is observed, is the means by which "variety, intricacy, and harmony" are effected, and is capable of being "applied either to objects of the same kind, in which the chief principle is contrast of the parts, or to objects of different kinds, in which the chief principle is disposition or contrast of different objects." This mode "is applicable to all the larger scenes" of this sort of gardening, "in connection with all the natural principles of arrangement, except *culture* and *bordering*, where it would cause much inconvenience in pulverizing the ground." And "even there it may frequently be introduced with advantage and effect; but considerable judgment is requisite to decide when ornamental effect should give way to convenient culture. In shrubberies, and scattered trees or shrubs, either alone, or seen in *connection* with any other of the materials" of this description of gardening, it "is an indispensable requisite, and can never be omitted, without foregoing one of the greatest beauties of nature; one that is universally prevalent in every variety of natural scenery, which is instantly perceived, and so highly fascinating to the man of taste, that no other beauty can compensate for its absence." The beauty here meant is connection, "which, according to the objects connected, may either produce order, variety, intricacy, or harmony." This beauty is, however, supposed to be little felt by gardeners from several causes. Yet "the principles of natural effects are universal in their application, even with regard to utility. These principles, and also the imitation of the effects produced by the extremes of their operation, will ever be the true criterion of beauty in the arts of taste, or in ornamental productions."

The principal subjects of this species of gardening are those of parterres, which are of several different kinds; hot-houses, or stoves of different sorts, conservatories, green-houses, &c. See these several heads.

There are also some others, such as "small groups of shrubs and flowers placed upon lawns, shrubberies, and pleasure-grounds." The first, it is remarked by the author of the treatise on "Country Residences," when made use of in such situations, "should always be of very irregular shape;" but, "when upon gravel, this must depend upon circumstances. If, in a part where art is avowed and ought to prevail, then the more artificial the form so much the better; but if merely a group for dividing or varying a road, walk, or natural path, at a distance from artificial scenes, then it should be as irregular as those upon a lawn." In general, "whether these groups are made regular or irregular, they require to be cultivated for some years afterwards;" which, "according to the present mode of digging them, produces a harsh and disagreeable boundary line;" which, it is supposed, should be destroyed as much as possible. This is said to be easily effected by keeping "the earth on the margin of the group of the same level as the lawn or pasture, and to let both blend harmoniously together." Groups of this nature being only dug till the growth of the shrubs render it unnecessary; it is suggested, that "the pasture should be allowed gradually to encroach among the shrubs and flowers, until at last it wholly covers the surface." After this, the group becomes rough and picturesque; the flowers, still continuing to grow among the shrubs, will produce exactly what we see in natural groups, with only the "elegant difference" of having fine suitable plants instead of coarse weeds.

Where shrubs are employed in this grouping way, it is observed, that "the great art is to put them in irregularly; for though the outline of the ground to be cultivated must, even under the best taste, be somewhat formal, yet the shrubs can always be planted as irregularly as if no outline or form of group existed. This, however, is a thing never done; for whatever be the form of the ground which is to be dug, the shrubs are regularly distributed over every part of it: even when digging is no longer attended to, still none of the shrubs are thinned out, but the whole left a formal, unconnected clump of vegetation; an appearance, it is remarked, as different from the irregular group-thickets of nature, as a green hillock is from a rocky precipice." It is admitted that "groups, or rather masses of formal shapes, such as ovals in front of small villas, or basket-work patches upon a lawn in the front of a mansion, must always have determinate outlines, as being devoted chiefly to tender flowers and flowering shrubs, they will always require to be cultivated. Their outlines may either be formed of elegant masonry, wood, basket-work; or flowers, as thrift, daisy, &c., or often a broad margin of turf, when surrounded by gravel." And it is suggested that "the general form of these masses may be oval, circular, pentagonal, or fanciful, according to pleasure; and their surface may either be kept level with the lawn, or gradually raised from the margin to the centre. But when raised in this way, it is suggested, that the sides ought always to present a concave slope, and not a convex one, as they commonly do, and which has a very bad effect." It is concluded, however, in respect to groups, "that neither those of irregular, or of regular shapes, ought ever to be placed but where they have a proper relation and union with what surrounds them."

In regard to shrubberies, or the narrow belts or strips of shrubs and flowers which occasionally form the main ornament of small residences, they are supposed useful in their effect, when executed according to the principles of nature and good taste, though their "tawdry insipidity" has been reprobated by Mr. Knight. They are commonly formed for the purpose of getting a walk to some particular situation or place, as the kitchen-garden, farm, wood, &c. or merely through the shrubbery for its own sake, and such views as it may afford. On this principle three things are considered necessary in forming them; the first of which is, that of "the arrangement and grouping of the trees, which ought to be that of general nature." The second is that of "the intermixture of glades and pasture, which in most cases is an essential requisite." And the third, that of "the judicious introduction of views of more distant scenery;" which is most frequently desirable, unless in such parts as, by way of contrast, are preserved in umbrosity. This is "naturally connected with picturesque improvements," and depends upon the general principles of this sort of gardening. See SHRUBBERY.

Pleasure-grounds are destined to comprehend a great variety of interesting scenery of different kinds, introduced for the purposes of ornament, convenience, and utility; which are suggested as admitting of being arranged on the general principles of convenience, connection, particu-

lar

lar expreffion, and picturefque effect. See PLEASURE-*Ground.*

Culinary gardening is that branch of the art which comprehends the various methods of producing all forts of fruits, as well as ufeful vegetables, roots, herbs and plants for the fupport and luxury of mankind. It is a fort of cultivation moftly confined within rather narrow limits, and which is performed in a great meafure by human labour.

Principles of Culinary Gardening.—Its principles chiefly depend upon a correct knowledge of the nature, general economy, habits and modes of fructification of plants, trees, &c. in combination with thofe of the proper preparation of the foil, the methods of cropping, and the management which is neceffary afterwards. It is likewife capable of deriving great affiftance from the application of different arts and fciences.

Preparation of the Soil.—The proper performance of this depends upon a variety of circumftances, fuch as the nature of the land, the kind of crop that is to be cultivated, and the feafon at which it is put in. After the primary operations of clearing and draining have been executed, it is generally neceffary to break down and reduce the earth into a fine ftate of mould by common or trench-digging; and the expofure of a large furface to the action and influence of froft, or the effects of heat and moifture in alternation, as in ridging and fummer-trenching. See RIDGING and TRENCHING.

There are other modes that contribute to the production of the fame effect, fuch as the growth of particular forts of crops, as celery, and thofe of the carrot, parfnip, beet, and others of the tap-rooted kind: and the application of ftrong hand-hoes to the fuperficial parts at proper periods, as when the foil has a difpofition to fall down in a powdery condition. This laft method will likewife at the fame time extirpate and deftroy a number of weeds, but the neceffity of this fhould be conftantly well guarded againft, by fuffering none to run to feed in the garden.

Confiderable advantage may alfo be gained in the view of rendering garden ground mellow, by the proper application of fuitable manure. In this view the manure fhould not have advanced too far in the ftate of decompofition. Compofts and very rotten manures produce but a trifling effect in this way, though highly beneficial in various other refpects. It feems not improbable but that, in hot feafons, where the foil is inclined to be heavy and of courfe lumpy, benefit might be derived from the ufe of a fmall roller upon the furface.

How far advantage is capable of being derived from the *refting* of the foil in this fort of culture, is perhaps not yet fully afcertained; but certain kinds of garden crops are commonly fuppofed to grow better on new land than fuch as have been long under cultivation, as thofe of the onion, the carrot, the turnip, and the potatoe kinds. Therefore different methods of effecting this purpofe have been propofed, fuch as laying down portions of garden-ground annually with grain and grafs feeds, and breaking others up. This can, however, be only practifed in large gardens, either with convenience or the profpect of fuccefs; and in all cafes muft be employed with much caution.

Another mode is by trenching to different depths alternately, as three and two fpits, fo as to have new or frefh furfaces from the top, middle, and bottom, cropping each three years, and letting the future furfaces reft fix. This practice has been recommended by Mr. Walter Nicol. But it can only be had recourfe to in particular inftances, as few gardens admit of three fpits' depth of good foil. Befides, the expence of performing it affords a confiderable objection.

Succeffion of Crops.—This is a matter of confiderable importance in culinary gardening, as the growth of good and healthy vegetables, and the keeping of the foil in a proper ftate of heart, in a great meafure, depends upon it. The main principle on which it proceeds is that of never growing what are termed exhaufting crops in fucceffion; or letting two or three of the fame nature or fort follow each other. It is well known to horticulturifts, that under fuch circumftances they conftantly become deteriorated in quality, and greatly leffened in the quantity of produce. The clofenefs of fhade afforded by the plants is alfo another principle that fhould be carefully attended to in managing this bufinefs. In this practice it has been fuggefted by Mr. London that "the vegetables cultivated fhould be divided into claffes according to their refpective *natures, modes of culture,* and *duration.*" It is conceived that in refpect to *natures,* they may be divided into, 1ft. Such as have ramofe roots, as the cabbage, cauliflower, brocoli, &c. 2d. Such as have fufiform roots, as the carrot, beet, parfnip, &c. 3d. Such as are fquamofe, as the onion, leek, efchalot, &c. 4th. Such as are fibrous, as the lettuce, endive, &c. 5th. Such as are tuberofe, as the potatoe, Jerufalem artichoke, &c. They are fuppofed capable of further divifion, "into fuch as partake of two of thefe divifions, as the fufiform and fibrous, exemplified in the bean, pea, kidney-bean, fpinach, &c. &c."

The writer adds that "fome crops require to be cultivated in large quantities, as peafe, turnips, onions; others in fmall portions, as moft fallad and pot-herbs. Some require very rich foil, and generally manure previoufly to planting or fowing, as celery, cauliflower, and leeks; others require a tolerably rich foil, but are much injured by manure immediately previous to their infertion, as carrot, beet, and moft efculent roots of fufiform fhapes."

In regard to *modes of culture,* it is fuggefted that culinary vegetables may be diftinguifhed "into, 1ft, fuch as are fown upon the furface broadcaft, as onions, turnips, fpinach, &c. 2d. Such as are fown or planted on the furface but in drills, as peafe, beans, and potatoes. 3d. Such as are placed in hollow trenches, as celery, and fometimes artichokes. 4th. Such as are fown or raifed on beds or ridges, as afparagus, fea-kale, and frequently early crops of peafe, &c. 5th. Some require the foil to be often pulverized while growing, as potatoes, peafe, and moft drill-crops; others admit of it but in a fmall degree, as onions, leeks, carrots, &c. Some are occafionally and often materially injured by it, as ftrawberries."

In relation to *duration,* it is obferved that fome are fown and removed within three months: as early crops of turnips, radifhes, braffica plants, for removal, &c.; others continue double that time, as onions and potatoes; others treble, as frequently brocoli and cabbages; fome continue two feafons, as parfley, fennel, &c.; others for feveral years, as ftrawberries, afparagus, artichokes, &c. By attentively confidering thefe and other divifions which the fubject admits of, it is fuppofed much advantage may be gained by the culinary gardener, and appropriate fucceffions of crops formed: "thus celery, by being planted in hollow trenches, pulverizes the foil in a high degree; by requiring a confiderable quantity of manure it enriches it; both which properties are neceffary for the production of plants of large, ramofe, or fafciculate roots, which penetrate deep into the foil, fuch as artichokes, fcorzonera, afparagus, &c. Again, thefe crops by remaining long on the foil, afford, when removed, an excellent fituation for fuch as are more

more tranfitory, as peafe, potatoes, &c." There are various other circumftances that are deferving of attention on this fubject, as may be feen by confulting the articles CROPPING and COURSE *of Crops*.

After-management.—There are fcarcely any two plants that require exactly the fame means in the whole of their cultivation, though in many inftances the differences are but very fmall. In the annual and biennial kinds, the fimilarity in many cafes is very confiderable; but in that of the perennial fallad and pot-herb forts it moftly differs in a high degree. The neceffary culture in each may be under the names of the particular plants. Whatever the nature of the culture that is requifite may be, in any fort of plant or vegetable, it fhould always be executed in due feafon, and under proper circumftances in refpect to the ftate of the ground. There are feveral other matters in the performance of this bufinefs that require the attention of the gardener, as will be feen under their proper heads.

Ufeful and important alterations and changes are capable of being produced in vegetables, by diverting their natural and ufual habits of growth and production. A very plain and eafy method of accomplifhing this, in many cafes, is by fetting and fowing, at unufual periods, as between thofe in which it is ufually performed. The fame thing is alfo capable of being effected by making ufe of different forts of foil for the purpofe, as fuch as are more early or late, in confequence of their natural qualities. As the great or final purpofe of every individual vegetable is that of the production of its flower, fruit, and feed, it naturally purfues its growth till thefe ends are fully effected; which is the cafe in very different lengths of time, according to the kind of plant or tree, being fhort in fome, while in others it takes up a very confiderable length of time. In this view, by cutting the annual and biennial forts, fo as to prevent thefe from taking place, they may be continued for feveral years. And in fome cafes perennials may be made to afford crops at unufual feafons. The fame thing happens to fome fruit trees and fhrubs when denudated of their leaves and flowers in the late vernal feafon.

In different fruit-trees that do not ufually afford any produce for a great length of time, as the walnut and mulberry, it has been found by Mr. A. Knight, that by grafting them by approach with the bearing branches of old trees, they may be brought into bearing in the courfe of three years; and it is fuggefted that this method may probably be applied with fuccefs in various other fimilar cafes. See GRAFTING.

The practical operations of this branch of gardening divide themfelves under a variety of different heads, as confervatory, efpalier, green-houfe, hot-bed, hot-houfe, hot-pit, hot wall, mufhroom-houfe, orchard, planting, pruning, ftandard-trees, training, vermin, wall-fruit, wall-tree, watering, watering-engine, weeding, &c.

GARDENING, in *Falconry*. To *garden a hawk*, is to put her on a turf of grafs, to cheat her.

Some alfo ufe the fame phrafe for the giving her an airing, or letting her fly at large.

GARDENSEE, in *Geography*, a town of Pruffia, in Oberland; 25 miles N.N.E. of Culm. N. lat. 53° 35'. E. long. 18° 43'.

GARDENSK, a town of Samogitia; 25 miles S. W. of Miedniki.

GARDENSTOWN, a fmall town of Scotland, in the county of Bamff, fituated in a bay at the entrance into the frith of Murray, with an harbour chiefly adapted to fifhing-boats and fmall veffels; feven miles E. of Bamff. N. lat. 57° 37'. W. long. 2° 15'.

GARDICCHI, a town on the weft coaft of the ifland of Corfu; feven miles S.W. of Corfu.

GARDIE, PONTUS DE LA, in *Biography*, who flourifhed in the middle of the 16th century, was fon of a gentleman of Gardie, near Careaffone, in France. He ferved firft under marfhal Brifac in Piedmont, and afterwards in the troops fent to Scotland by king Henry II. After this he went into the Danifh fervice, and was taken prifoner in an action againft the Swedes. The Swedifh general, who was himfelf a Frenchman, recommended Gardie to the king, who immediately gave him a commiffion in his army. He was afterwards knighted and created baron of Eckholm, and was fent by John, king of Sweden, as ambaffador to the emperor Rodolph, and to pope Gregory XIII. In 1580 he was made general of the Swedifh army in a war againft the Ruffians, from whom he took fome important places. The government of Ingria and Livonia was conferred upon him for his great fervices, and he proceeded in a career of fuccefs, and was honoured with other important offices. In 1585 he was unfortunately drowned at the entrance of the port of Revel. He had married a natural daughter of the king, and from this union are defcended the counts de la Gardie, who are among the principal nobles of Sweden. Moreri.

GARDINER, STEPHEN, an Englifh prelate and ftatefman, who flourifhed in the fixteenth century, and who, by the part which he took in the reign of Mary, has had his name tranfmitted with infamy to pofterity. He was a native of St. Edmunds Bury, and born about the year 1483. He is fuppofed to have been the natural fon of Dr. Lionel Woodvill, bifhop of Salifbury, and brother to Elizabeth, queen confort to Edward IV. He took his furname from his reputed father, a menial fervant of the bifhop, who married his mother with a view of preventing the confequences which would have refulted, had the real ftate of the cafe been known. Of the early years of this remarkable man we have no account; but at the proper age he was fent to Trinity-Hall, Cambridge, where he purfued his ftudies with uncommon diligence, and in a fhort time obtained a high degree of reputation for the brilliancy of his talents, for correctnefs and elegance in writing and fpeaking Latin, and for extraordinary fkill in the Greek language. As a claffical fcholar he read inceffantly the works of Cicero, and imitated his ftyle fo clofely, as to draw down the feverity of criticifm on that account. He applied himfelf to the ftudy of the civil and canon law, and took his degree of doctor in the year 1520. Different ftatements are made refpecting his firft patron: according to fome, it was Thomas Howard, duke of Norfolk, though others afcribe the notice taken of him to cardinal Wolfey. To the latter it is known that Gardiner acted as a private fecretary, and was for fome time one of the cardinal's family. In this fituation an incident happened which introduced him to the knowledge of the king. Cardinal Wolfey having projected an alliance with Francis I. king of France, Gardiner was employed to draw up a plan of it. While he was engaged upon the work, the king chofe to examine the progrefs which was made by the fecretary, and being well pleafed with the performance, and ftill more with his converfation, and with his fitnefs for bufinefs, he not only expreffed his fatisfaction of the young man's talents, but admitted him into a confidential intercourfe, and from this period fcarcely any ftate affair of moment was concluded without the advice of Gardiner. In the year 1527, or 1528, he was appointed, in conjunction with Edward Fox, to an embaffy to Rome, to negociate the bufinefs of the king's divorce from queen Catherine. Although Fox would naturally rank higher than his

his coadjutor, yet Gardiner, being efteemed the beft civilian in England, was appointed chief of the embaffy, and having been already admitted into the king's cabinet council for this affair, was ftyled in the cardinal's credentials to the pope, "Primary Secretary of the moft fecret counfels." The cardinal calls Gardiner "the half of himfelf, than whom none was dearer to him," and he affured the pope he might fay with the utmoft fafety to Gardiner whatever he would deliver to himfelf. At firft the pope feemed to be playing a double game, but by the reprefentations and addrefs of Gardiner he at length obtained a commiffion from his holinefs, appointing cardinals Wolfey and Campeggi to determine the bufinefs in their own way. For this important fervice Gardiner was highly applauded by his mafter, by the king, and by Anne Bullen, who under her own hand affured him fhe felt every difpofition to render him all the grateful returns in her power. Having fent home his colleague Fox, the fecretary remained at Rome, hoping to fecure the papal crown for Wolfey, to which he had long afpired, and which the dangerous illnefs of Clement VII. gave him fome hopes of attaining. Gardiner acted with fo much zeal and difintereftednefs on this occafion, that he fecured the fuffrages of at leaft one-third of the whole number of cardinals. The recovery of the pope put an end for a time to the hopes of the contending parties; neverthelefs the cardinal was aware of the great obligations he was under to Gardiner for the zeal which he had fhewn in his behalf: nor was he lefs pleafed with him for reconciling the pope to the endowment of his two colleges at Oxford and Ipfwich out of the revenues of the diffolved leffer monafteries. Gardiner was recalled from Rome to manage the king's caufe of divorce before the legates, and immediately on his return he was appointed to the archdeaconry of Norfolk, which was the firft inftance of his preferment in the church, but on account of his great ufefulnefs to the fovereign he was raifed to the office of fecretary of ftate. In this fituation he was confidered as having a large fhare in the management of all important affairs, and was particularly confulted by the king when cardinal Campeggi declared that the caufe of the divorce muft be fent back to Rome, and that himfelf and his colleague could proceed no farther. Gardiner, by the affiftance of archbifhop Cranmer, found a method of extricating the king from his difficulty. (See Cranmer.) The new method of proceeding in this bufinefs contributed to haften the ruin of Wolfey, who had fome time been fufpected by the monarch of being inimical to the divorce. In his diftrefs the cardinal had recourfe to his old fervant, the fecretary, from whom it is believed he met with as fincere returns of gratitude and real friendfhip as he could defire or expect. In the year 1530 Gardiner was employed, in conjunction with Fox, to procure from the univerfity of Cambridge a declaration in favour of the king's caufe. He was at this time mafter of Trinity Hall, and by the influence which this office gave him they fucceeded in their plans. For this and for his other fervices in behalf of the king he was rewarded by very valuable ecclefiaftical promotions, till at length, in 1531, he was confecrated bifhop of Winchefter. In 1533 the new prelate fat in the court with archbifhop Cranmer, when the latter pronounced the fentence by which queen Catherine's marriage was declared null and void. In the fame year he was fent ambaffador to France, whither he was foon followed by Dr. Bonner. The object of this journey was to attend an interview between the pope and the French king at Marfeilles, and to difcover their defigns, which Henry and his council fufpected to be of a hoftile nature againft England. They did not, on this occafion, fcruple to declare that Henry VIII. would appeal to a general council, if the pope fhould pretend to proceed to judgment in his caufe. Upon the return of bifhop Gardiner he was called upon, with the other bifhops, to acknowledge the king as fupreme head of the church, and to take the oath appointed for that purpofe. With this fummons he not only complied with the utmoft readinefs, but publifhed a defence of the king's fupremacy. His pen was made ufe of upon other occafions, in vindicating the king's divorce, his fubfequent marriage, and his emancipation of the kingdom from the tyranny of the papal fee, upon which fubjects his various treatifes obtain him a high degree of reputation. Gardiner was, however, zealoufly attached to the fuperftitions of the Romifh church, and oppofed with all his ftrength any attempts made to introduce the principles of the Proteftant reformation. In the year 1535 he was warmly engaged with Cranmer, who had fent him notice that he fhould vifit his diocefe, and who had made a propofal in the convocation to petition the king for leave to make an Englifh tranflation of the bible. About this period Gardiner refumed his embaffy to France, where he prevailed on the French king to remove from his dominions Dr. Reginald Pole, then dean of Exeter, a circumftance that gave rife to the animofity which afterwards fubfifted between thefe churchmen. At this period he entered a ftrong proteft refpecting a project of a religious league with the Proteftant princes of Germany. In 1538 he was fent ambaffador to the German diet of Ratifbon, where he acquitted himfelf with much credit as to the objects of the commiffion, but he there fell under a fufpicion of holding a fecret correfpondence with the pope, on the fubject of rendering popery triumphant in England. But Henry was ftill too much attached to the doctrines of Rome to bring his prelate into any trouble on account of his zeal on this fubject: he even took pains, notwithftanding his hoftility to the court of Rome, to prevent his fubjects from departing from their old eftablifhed creed. In fome cafes he had recourfe to the aid of perfecution in juftification of the caufe of popery. John Lambert had written a paper againft the doctrine of the real prefence, which fell into the hands of archbifhop Cranmer, before whom and bifhop Latimer he was fummoned, and there admonifhed to retract what he had written. Lambert was not to be intimidated, as he could not be convinced; he appealed to the king, who, by the advice of Gardiner, cited him to appear in Weftminfter-hall. Here the king fat in great ftate, furrounded by the bifhops, nobility, clergy, and council: a long debate enfued, in which the honeft man was overwhelmed by the multitude of his opponents, and reduced to filence. Henry then demanded of him, if he were convinced, and whether he would live or die? He replied, with great humility, that "he committed his foul to God, and fubmitted his body to the king's clemency." The king fternly told him, for clemency never entered into the compofition of Henry VIII., if he did not recant he muft die, for he would not be a patron of heretics. Lambert was a hero, as well as an honeft man; he refufed to recant, and was burnt in Smithfield with circumftances of uncommon cruelty. This tragical fcene was unqueftionably the refult of Gardiner's advice, and on that account claims to be narrated in his life, though it muft be again referred to. See Henry VIII.

In 1539 Gardiner diftinguifhed himfelf by his exertions to procure the act of the fix articles, commonly denominated the Bloody Statute; and very foon after the paffing of this act, Dr. Barnes and two others were burnt in Smithfield for herefy, at the fame time that three papifts were hanged for owning the pope's fupremacy and denying the king's, which

caufed the remark of a foreigner, " that in England there was a ftrange method of managing matters, for thofe that were the pope's adherents were hanged, and thofe who were againft him were burnt."

Upon the fall of Cromwell, in 1540, Gardiner was elected chancellor of the univerfity of Cambridge, in which fituation he was the conftant opponent of whatever was propofed to be introduced in favour of improving the plans of education: he was the advocate for old cuftoms and practices, becaufe they were old, though at the fame time they might be vicious and abfurd. He even charged fir John Clarke with endeavouring to remove " an evil well placed."

In 1542 a convocation was held to examine the merits of the tranflation of the Bible. Gardiner and the popifh party reprobated it as a moft unfaithful verfion of the original, and to obtain a decree againft it they offered to produce a better, fully expecting that the time requifite for the accomplifhment of fo great an undertaking, might afford fair opportunities for fuppreffing it altogether. Cranmer, however, had the addrefs to get it referred to the examination of the two univerfities; and, to the extreme mortification of Gardiner, he made fome further progrefs in the work of reformation, by obtaining a mitigation of fome of the fevere acts concerning religion. Gardiner, about this time, was one of the commiffioners appointed to conclude a treaty of peace with Scotland, and to negociate a marriage between the prince of Wales and the young Scottifh queen; but in all his public employments he never loft fight of a favourable opportunity of impeding the progrefs of freedom and inquiry in religious concerns. With this view he probably employed perfons as fpies upon the conduct of thofe attached to the reformed principles; and, having been informed that feveral fuch were to be found at Windfor, he moved the king in council that a commiffion might be granted for fearching fufpected houfes in that town, in which fome books were found written againft the fix articles. Four perfons were apprehended, tried, and condemned for herefy, of whom three were fentenced to be burnt. After this, Gardiner himfelf fell under the fufpicion of the king, and an order was made out for committing him to the Tower; but the prelate, appearing in perfon in the prefence of his fovereign, contrived to obtain a pardon before any fteps could be taken to prove his guilt. In the year 1545 he oppofed and defeated a defign which Cranmer had formed, by a revifion and reformation of the canon laws, to adapt them to the new order of ecclefiaftical affairs in England, and to a period of ftill further improvement. During this fame year Gardiner was employed in Flanders to carry on political negociations with the emperor and the French king, and while he was abfent from the kingdom Cranmer endeavoured to obtain the king's confent for the abolifhing of fome of the prevailing fuperftitions. Gardiner was apprifed of the plan, and writing to the king to fay that his bufinefs was in a good train, he took that opportunity of earneftly entreating him not to fuffer any innovation in religion, for if he did there would be no hope left of fucceeding with the emperor. Soon after Gardiner's return from the continent he contrived to fet on foot a perfecution againft the proteftants upon the ftatute of the fix articles. A charge was firft brought againft Mrs. Anne Afcough, a lady of unblemifhed manners, exemplary piety, ready wit, and who had enjoyed the advantages of an excellent education. By making her the object of their perfecution, they expected to extort from her confeffions which would furnifh matter of accufation againft fome of the principal nobility and other high characters in the kingdom. After feveral examinations, in which the tortures of the rack were reforted to, they condemned her to the flames, in which fhe fuffered, with three others, for fpeaking againft the real prefence. Sir George Blage, one of the gentlemen of the king's privy chamber, was likewife condemned to be burnt, but the king interfered and fet him at liberty.

The next attempt made by Gardiner to crufh the favourers of the reformation, which failed in its defign, and which irrecoverably alienated the king's mind from him, was directed againft Catherine Parr, to whom the king had been married three years. After this, Henry never admitted the bifhop into his prefence, excepting once, when he was informed that he came to tender him a benevolence, granted him by the clergy. On that occafion he barely fuffered him to approach, to deliver his meffage, and when he had received it went into another apartment. So completely was the king alienated from Gardiner, that, though he had formerly appointed him one of his executors, and of the council to prince Edward, he now ordered a new will to be drawn, in which his name was omitted.

After the death of Henry, Gardiner, though the power was taken out of his hands, objected, as violently as ever, againft the meafures of reform which Cranmer was defirous of introducing, and on this account he was imprifoned in the Fleet, where he was treated with much feverity. In this ftate of confinement he continued to the end of the feffion of parliament, when he was liberated by the king's pardon, though he had never been formally accufed of any particular crime. Being fet at liberty he repaired to his diocefe, where he conformed himfelf, outwardly at leaft, to the orders of the council, fo that it was impoffible to take any advantage againft him; but no doubt was entertained that he did all that lay in his power, privately, to oppofe the principles of the reformation. He even preached againft them, and exhorted his people to beware of receiving any other doctrine than that which he had taught them. Of this conduct a complaint was made againft him, in the council, before whom he was fummoned in the year 1548, and, having been feverely reprimanded, was ordered to keep his houfe till he had given fatisfaction, which was to be by preaching before the king, according to certain directions to be given him. On the day appointed he did preach, but his difcourfe made the breach ftill wider, and he was committed a clofe prifoner to the Tower. Here he was detained two years, and then brought before the council, where he was informed that they fat by a fpecial commiffion to judge him, and that he was required to fubfcribe to the articles which had been fent to him. Gardiner was inflexible, and refufed; and, in confequence of it, he was in the year 1551 deprived of his bifhopric for difobedience and contempt of the king's authority. The bifhop protefted againft his judges, and objected to their commiffion; and when fentence was about to be given againft him he appealed from the delegates to the king, but no notice was taken of the appeal. After this he was deprived of thofe little indulgences, which had been before allowed him in his confinement, and he was kept prifoner in the Tower during the remainder of king Edward's reign. Here he fpent his time in compofing a variety of Latin poems, tranflated into Englifh verfe feveral of the poetical parts of the Old Teftament, and wrote fome controverfial tracts. He anticipated a change of circumftances which fhould put him in poffeffion of the degree of influence and profperity that he formerly enjoyed. In the year 1553 his hopes were realized in the acceffion of Mary to the throne of thefe realms. On the 8th of July, he was appointed to perform the Romifh obfequies for the late king, who was buried at Weftminfter, with the Englifh fervice, by archbifhop Cranmer: and on the following day he refumed the poffeffion of Winchefter-houfe, after an abfence of five

years, and on the 23d he was declared chancellor of England, and immediately became the queen's prime miniſter, and was entruſted with the chief management of public affairs. He now determined to re-eſtabliſh the popiſh religion, and to reconcile the kingdom to the ſee of Rome. Preaching, except by the queen's ſpecial licence, was inſtantly prohibited: images were ſet up by the popiſh party, and the old rites and the Latin ſervice were very generally introduced. Though the laws of Edward VI. were ſtill unrepealed, yet theſe practices, which were highly illegal, were connived at and abetted by the council, which, being modelled after Gardiner's own mind, harraſſed with impriſonment and very ſevere uſage, ſir James Hales, one of the judges who had ventured to inſtruct the juſtices in Kent, to put in execution the laws of Edward that were ſtill in force. The new government ſoon ſhewed a determined hoſtility to the Proteſtants, who, by the authority of Gardiner, were moleſted in the religious ſervices which the people attended with unuſual ſeriouſneſs, under the apprehenſion that their liberties would ſoon be reſtrained. Spies were employed in all the churches in London, who, to pleaſe their ſuperiors, laid informations againſt the preachers. Theſe had no redreſs; they were obliged to ſubmit to the preſcribed terms, or were committed to priſon. October the 1ſt was appointed for the coronation of the queen, when a general pardon to all offenders was proclaimed, with the exception of thoſe who were impriſoned in the Tower and other places, on the charge of being Proteſtants. On the 10th of the ſame month Gardiner opened the firſt parliament in Mary's reign; and one of the early acts of this aſſembly was the paſſing a ſtatute for confirming the marriage of Catherine of Arragon, the queen's mother, with Henry VIII., in the preamble of which the divorce was pronounced impious and illegal, and the whole blame of it, againſt all truth and juſtice, attributed to archbiſhop Cranmer. He next cauſed a bill to be brought into the houſe of lords, which, after a debate of ſix days in the houſe of commons, was at length carried; by this, all the laws relating to religion made in king Edward's reign were repealed, and it was enacted at the ſame time that there ſhould be no other form of divine ſervice but what had been uſed in the laſt year of king Henry VIII. This was a prelude to the moſt ſevere and tyrannical meaſures: ſeveral Proteſtant prelates were deprived of their ſees; and their places were filled by Papiſts who had been excluded in the laſt reign. The commiſſion for the deprivation of the former was directed to Gardiner, Bonner, biſhop of London, and others. The Proteſtants who had the means, ſought for ſafety by withdrawing into foreign parts, and thoſe who were left behind began to feel the effects of the biſhop's vengeance. The priſons were crowded with victims, waiting with anxiety and terror the decrees of a bloody tribunal. In the mean time Gardiner was engaged in the management of a treaty of marriage between the queen and Philip, ſon of Charles V., king of Spain. This meaſure was extremely odious to the nation in general, and though the articles of the treaty were drawn with great art and plauſibility, and apparently much in favour of England, yet when they were publiſhed they gave no ſatisfaction to the people, who expected that if it took place, not only popery would be confirmed, but a Spaniſh government and inquiſition be eſtabliſhed, and, perhaps, England at length would be reduced to the degraded ſituation of a province to Spain. The general diſcontent on this ſubject gave riſe to the inſurrection headed by ſir Thomas Wyat. This was ſoon quelled, but the inſurgents were purſued with unabating fury, and the odium of the meaſures was caſt on Gardiner, which made him univerſally hated. On the ſame occaſion, the princeſs Elizabeth was ſent to the Tower, under the pretence of being concerned in Wyat's conſpiracy, but as he publicly acquitted her of this charge, and as nothing could be produced againſt her, ſhe was releaſed from her confinement. In 1554, Gardiner was enabled to conclude the treaty of the queen's marriage, and in July the queen met the Spaniſh prince at Wincheſter, where they were married by the biſhop. He now felt himſelf ſecure and determined to avenge himſelf on the Proteſtants in retaliation for what he had ſuffered from them during the preceding reign. Cardinal Pole was now admitted as the pope's legate in England, and ſoon after his arrival he declared to the parliament the object of his miſſion, and invited them to reconcile themſelves and the kingdom to the apoſtolic ſee. To this they readily agreed, and preſented a petition to their majeſties for the purpoſe, which, being ſignified to the legate in the royal preſence by Gardiner, the cardinal abſolved them, and received the people of England once more into the boſom of the catholic church. Almoſt immediately after this an act was paſſed, by which the authority of the Roman pontiff was re-eſtabliſhed, and a bill quickly followed it, by which the old ſtatutes againſt the heretics were revived in full force. From this period Gardiner gave full ſcope to his ſanguinary diſpoſition; he glutted himſelf with the blood of the Proteſtants, and was for ſome months perſonally concerned in the moſt ſavage acts of barbarity. Finding, however, that by his activity in the bloody work he had rendered himſelf ſufficiently odious, not only to Proteſtants, but to all the moderate perſons of his own party, he withdrew from taking an open part in it. He was now appointed with others to proceed to Calais, to a kind of congreſs which was held there for the purpoſe of mediating a peace between the emperor and the king of France. During this negociation, the pope died, and upon the elevation of his ſucceſſor, Gardiner took every precaution to ſecure to himſelf the dignity of cardinal, and the ſucceſſion to the ſee of Canterbury. In the month of October 1555, the biſhop opened the ſeſſions of Parliament, and in a ſhort time afterwards he was taken ill of a diſeaſe which terminated his life about the middle of November. The cauſe, and the exact time of this prelate's death, have been variouſly related. By ſome his laſt diſeaſe is ſaid to have been the gout; but by others it is regarded as a ſuppreſſion of urine, and ſome have imputed the immediate cauſe of his death to the effect of God's judgments on him for his cruelties exerciſed towards the biſhops Ridley and Latimer. By every hiſtorian he is repreſented as having ſuffered the moſt excruciating agonies on his death-bed, and to have felt the utmoſt remorſe in the recollection of his paſt miſdeeds. Frequently did he exclaim, with the utmoſt anguiſh of mind, "Erravi cum Petro, ſed non flevi cum Petro." But the errors of the apoſtle Peter were not to be compared, and ought not to be mentioned in connection with the foul deeds of the blood-thirſty Gardiner. The denial of his maſter in one caſe was probably the reſult of timidity only: the perſecutions of the biſhop of Wincheſter were the deliberate acts of a malignant heart, ſteeled againſt every ſentiment of charity, honour, and juſtice. The perſon of the biſhop perfectly correſponded with his mind, if the account given of it by his ſucceſſor Dr. Poynet can be relied on: "This doctor," ſays he, "hath a ſwarth colour, hanging look, frowning brows, eyes an inch within his head, a noſe hooked as a buzzard, noſtrils like a horſe, ever ſnuffing in the wind, a ſparrow mouth, &c." This was, probably, in ſome degree, a caricature repreſentation, dictated by perſonal hatred; nevertheleſs it is a portrait well adapted to a perſecutor. It has, however, been remarked, that with all the deformity

of his mind, he was occasionally an encourager of learning, when the parties distinguished by it were of the Catholic faith. He was the patron of some young men who became distinguished public characters, and in two instances these were zealous Protestants as well as eminent for learning. The persons referred to were sir Thomas Smith, who had been secretary to Edward VI., and Roger Ascham; with regard to these, his attention to the interests of learning triumphed over his systematic enmity to heretics: he permitted the former to live in a state of privacy unmolested, granting him a pension of 100*l.* *per ann.* and the latter he preferred to be Latin secretary to queen Mary. Gardiner himself was an author, but his pieces are of no great moment. Several of his letters to the duke of Somerset, lord protector, and other persons, are extant in the first edition of Fox's "Acts and Monuments," and some to Smith and Cheke, on the pronunciation of the Greek language in Bene't college library at Cambridge. The character given of this prelate by one of his biographers is, that "he was proud and arrogant, obstinate and vain, of unbounded ambition, and master of the most profound dissimulation. Though possessed of much natural courage and resolution, as a courtier he was servile; and he scrupled not to violate his conscience, when he had objects of interest or ambition in view. The part that he acted against the Papal supremacy in the reign of Henry VIII., and the concessions which he offered to make in the reign of Edward VI., compared with his subsequent conduct in the reign of Mary, afford abundant evidence of the truth of the preceding remarks. They also shew that he had no fixed principles of religion, and that his persecuting spirit is to be attributed to false and narrow views of policy, and to a cruel malignant nature. When he pleased he could assume a winning address, and display no inconsiderable degree of eloquence, but when he was employed in trying heretics, as well as at other times, he would frequently descend to the lowest abuse, and the grossest scurrility, and behave in a manner very unworthy of the character either of a gentleman or a scholar, and still more those of a Christian and a bishop." Biog. Brit. Burnet's Hist. of the Reform.

GARDINER, in *Geography*, a post-town of America, in Kennebeck county and state of Maine, on the west bank of Kennebeck river.

GARDINER'S *Bay*, a large bay on the eastern extremity of Long island, on the coast of America. N. lat. 41° 3'. W. long. 72° 15'.

GARDING, or GARDINGEN, a town of Denmark, in the duchy of Sleswick; 28 miles W.S.W. of Sleswick. N. lat. 54° 24'. E. long. 8° 52'.

GARDNER, a township of America, in the county of Worcester and state of Massachusetts, incorporated in 1785, and containing about 14,000 acres, well watered, chiefly by Otter river, and 667 inhabitants; 58 miles N.W. of Boston.

GARDNER'S *Canal*, an inlet on the coast of New Hanover, extending about 40 miles from east to west. N. lat. of the entrance 53° 35'. E. long. 231° 17'.

GARDNER'S *Island*. See AMALGURA.

GARDNER'S *Island*, or *Isle of Wight*, an island of America, lying at the east end of Long island, in the state of New York, sheltered within Oyster pond and Montauk points; 10 miles N.W. of the latter, and as far S.W. of Plumb island. It contains about 3000 acres of fertile land, and yields excellent grass, wheat, and corn. Fine sheep and cattle are also raised upon it. It is annexed to E. Hampton, and is 40 miles S. westward of Newport, Rhode island.

GARDON, a river of France, which rises in the department of the Lozère, traverses that of Gard, receiving another river in its course, called "Gardon d'Alais," and runs into the Rhone, 4 miles N. of Tarascon.

GARDONE, a town of Italy, on the Mela; 15 miles E. of Brescia.—Also, a town of Hindoostan, in Dowlatabad; 36 miles S. of Amednagur.

GARDOUCH, a town of France, in the department of the Upper Garonne; 15 miles S.E. of Toulouse.

GARDSBY, a town of Sweden, in the province of Smaland; 28 miles N. of Wexio.

GARDSTRUM, a town of Sweden, in the province of Smaland; 7 miles N. of Calmar.

GARE, in our *Old Writers*, a coarse wool, full of staring hairs, such as grow about the shanks of sheep. 31 Edw. III. cap. 8.

GARED, in *Geography*, a town of Africa, in the kingdom of Suz, on the river Suz, famous for its Morocco leather.

GAREEA, a town of Bengal; 24 miles N.N.W. of Moorshedabad.

GAR-EL-MAILAH, *i. e.* the *Cave of Salt*, a sea-port of Africa, on the east coast of Tunis; 4 miles W. of cape Zibeeb.

GARENCIERES, THEOPHILUS, in *Biography*, a physician of the faculty of Caen, was a native of Paris. He received his degree before the age of twenty, and came over to England, where he abjured the Roman Catholic religion, in which he was born. He was incorporated in the university of Oxford on the 10th of March, 1657, and settled in London, where he was appointed physician to the French ambassador: but fortune was altogether adverse to him, and he died overwhelmed with poverty and distress. He was, however, a man of some science, as his works evince. They consist of a treatise, in English, on the nature and properties of the tincture of coral, printed in 1676, in 12mo.; and another in Latin, entitled "Angliæ Flagellum, seu, Tabes Anglica numeris omnibus absoluta," 1647, in 18mo. Eloy. Dict. Hist.

GARENGEOT, R. CROISSANT DE, an eminent French surgeon, was born at Vitre, a small town in Brittany, on the 13th of July, 1688. His father practised surgery at that place, and superintended his education, instructing him in the elements of his own profession. In order to acquire a greater extent of practical knowledge, Garengeot spent five years in the hospital of Angers, and in the great naval hospitals of Brittany; and afterwards made two voyages in the navy. In 1711 he went to Paris, where, from the narrowness of his means, he lodged with a barber-surgeon, but studied under Winslow, Thibaut, Meri, &c. and also under the expert masters of St. Côme, the most celebrated of the surgical schools. In 1725 he was admitted to the freedom of the corporation of St. Côme, through the favour of M. Mareschal, then first surgeon to the king. Soon after this, he gave a course of lectures on anatomy in the medical schools; and henceforth his reputation extended even to foreign countries; for he was elected a member of the Royal Society of London. He was also appointed demonstrator royal in the schools of medicine. On the establishment of the Society of Academicians, under the patronage of the king, in 1731, Garengeot was chosen "Commissaire pour les extraits," which office he retained until the year 1742. He then succeeded Terryer in the place of surgeon-major of the king's regiment of infantry. He died at Cologne, in consequence of an attack of apoplexy, on the 10th of December, 1759, at the age of 71.

The first of the works of Garengeot, entitled "Traité des Operations de Chirurgie," was published at Paris in 1720,

1730, and tranſlated into the Engliſh and German languages.—2. " Traité des Inſtrumens de Chirurgie," printed at Paris, and the Hague, 1723, and at Paris again in 1727, in two volumes, with plates.—3. " Myotomie humaine et canine, ou la manière de diſſéquer les Muſcles de l'homme et des chiens, ſuivie d'une Myologie ou Hiſtoire abrégée des Muſcles," Paris, 1724, 1728, 1750, two volumes, 12mo. The laſt of theſe editions is much more correct than the two former.—4. " Splanchnologie, ou, Traité d'Anatomie concernant les viſcères," Paris, 1728, 1729, in 12mo.; ibid, 1742, in two volumes, 12mo. A German edition was printed at Berlin, in 8vo. in 1733, which is ſaid to contain ſome valuable matter, but chiefly belonging to Winſlow and Morgagni. At the end of this work there is a diſſertation " Sur l'origine de la Chirurgie et de la Médicine, &c." in which Garengeot diſplayed an exceſſive pride and vanity, according to Portal; attempting to trace all the moſt brilliant diſcoveries in medicine to the ſurgeons; but forgetting the obligations which he himſelf owed to Du Verney, Winſlow, and Morgagni. For inſtance, he denied that Harvey was the diſcoverer of the circulation of the blood, which he attributed to Rueff, a Swiſs ſurgeon.—5. His laſt work was entitled " L'Operation de la Taille par l'appareil latéral corrigée de tous ſes defauts," Paris, 1730, in 12mo. Eloy. Dict. Hiſt.

GARET, in *Geography*, the moſt northern province of the empire of Morocco, on the weſtern banks of the Mulluvia, which divides Morocco from the province of Tremecen. This province, about 20 or 25 leagues in length, is bounded to the north by the Mediterranean, to the ſouth by mount Atlas, and to the weſt by the province of Rif.

GAREWDUN, a town of Thibet. N. lat. 33° 18'. E. long. 80° 50'.

GAREZZO, a town of France, in the department of the Stura, on the Tanaro; 9 miles S. of Ceva.

GARFETE, a town of Portugal, in the province of Alentejo; 12 miles W. of Crato.

GAR-FISH, in *Ichthyology*. See Esox *belone*.

Gar-fish, *Great*. See Esox *oſſeus*.

GARGANEY, in *Ornithology*, a ſpecies of duck, the Anas querquedula of naturaliſts, diſtinguiſhed by having the ſpot on the wings green, and a white line over the eyes. Donov. Br. Birds.

This bird is ſeventeen inches in length, with varied plumage; the bill lead-colour; crown duſky with oblong ſtreaks; cheeks and neck purple with white ſtreaks; breaſt light brown with ſemicircular black bars; belly white; ſcapulars long, narrow, ſtriped with white, aſh-colour, and black; tail duſky, and legs lead-colour.

Female with an obſcure white mark over the eye; plumage browniſh-aſh; wings without green ſpot.

GARGANO, in *Geography*, a town of Naples, in the province of Capitanata; 7 miles N. of mount St. Angelo.—Alſo, a mountain of Naples, near the fore-mentioned town.

GARGANUS Mons, in *Ancient Geography*, *Mount St. Angelo*, a mountain of Italy, in Apulia, towards the north. One of its branches, projecting into the Ionian ſea, formed a promontory, called " Garganum promontorium."

GARGAPHIA, a fountain ſituated in Bœotia, near Platæa, the waters of which were poiſoned by Mardonius, in order to deſtroy the Greeks who were encamped in its vicinity; but the Platæans reſtored their original ſalubrity. Pauſan. in Bœot.—Alſo, a valley of Greece, in Bœotia.

GARGARA, a town of the Troade, near mount Ida. Strabo places it on one of the higher parts of this mountain, and ſays, that the promontory, on which Gargara was ſituated, was one of thoſe which formed the gulf of Adramyttium. Gargara is now a town of Aſiatic Turkey, in the gulf of Adramytti, in Natolia; 20 miles W. of Adramytti.

GARGARENSES, a people of Aſia, in Scythia, in the vicinity of the Amazons, at the foot of mount Caucaſus, on the northern ſide of it.

GARGARIDÆ, a people of India, attached to the worſhip of Bacchus, who inhabited the country near the Hypanis, and another river called Megarſas.

GARGARISM, Gargle, in *Medicine*, a liquid form of remedy, for diſorders in the mouth, gums, throat, &c.

The word is Greek, γαργαρισμα, formed of γαργαριζειν, *colluere*, to waſh, or the Hebrew *garghera*, the throat.

Gargariſms are compoſed of honey, ſalt, ſyrups, ſpirits, vinegar, waters, and decoctions; and produce their effects, by cleanſing, lubricating, &c. the parts.

Gargles are peculiarly uſeful in fevers and ſore throats; and they have this advantage above many other medicines, that they are eaſily procured and prepared: an uſeful gargle for ſoftening and cleaning the mouth may be made with a little barley water and honey, acidulated with vinegar. Gargles bear different appellations according to the uſes to which they are applied. An *attenuating* gargle, made by mixing ſix ounces of water, with one ounce of honey and a dram and a half of nitre, or by adding an ounce of honey and half an ounce of ſpirit of ſal ammoniac to the emollient gargle, may be uſed in the inflammatory quinſey or in fevers, for cleaning the tongue and fauces. A good gargle for this purpoſe may be made with ſtrong ſage tea, ſweetened with honey and ſharpened with vinegar. The *common* gargle, made by mixing ſix ounces of roſe-water with half an ounce of ſyrup of clove-July-flowers acidulated with ſpirit of vitriol, cleanſes the tongue and fauces, and ſerves alſo for a gentle repellent. The *detergent* gargle, prepared by mixing a pint of the emollient gargle with an ounce of tincture of myrrh and two ounces of honey, ſerves to cleanſe exulcerations and to promote the excretion of tough viſcid ſaliva. The *emollient* gargle, made by boiling an ounce of marſh mallow roots, and two or three figs, in a quart of water till near one half of it be conſumed, and ſtraining out the liquor, is beneficial in fevers, when the tongue and fauces are rough and parched, to ſoften theſe parts and promote the diſcharge of the ſaliva. Sir John Pringle recommends a decoction of figs in milk and water, with the addition of ſal ammoniac, as an uſeful gargle in the inflammatory quinſey, or ſtrangulation of the fauces.

GARGATHA Inlet, in *Geography*, a narrow channel between two ſmall iſlands, on the coaſt of Virginia. N. lat. 37° 44'. W. long. 75° 32'.

GARGAZA, in *Ancient Geography*, a town placed by Diodorus Siculus near the Palus-Mæotides. Ptolemy places it in Aſiatic Sarmatia.

GARGET, a diſeaſe of cattle, conſiſting in a ſwelling and inflammation of the head, affecting in particular the eyes and lips, and, at laſt, inflaming alſo the gums and tongue. This diſeaſe is ſometimes contagious. For the cure, the animal muſt be blooded every day, till the inflammation ſubſides. Immediately after the firſt bleeding, give 2½ ounces of Epſom ſalts, diſſolved in a pint of warm ale; and then the following drink, given night and morning, has been recommended; take of warm ale half a pint, ſal prunellæ, or powdered nitre, half an ounce; Venice treacle, a quarter of an ounce, mixed and given in one doſe. The animal muſt be kept clean, dry, and quiet. If bliſters appear on the

the tongue, they ſhould be broken, and dreſſed with ægyptiacum, or honey and vinegar. When the inflammation is likely to be very conſiderable, local bleeding is uſeful.

GARGIL, a diſtemper in geeſe, which by ſtopping the head frequently proves mortal. Three or four cloves of garlic, beaten in a mortar, with ſweet butter, and made into little balls, and given the creature faſting, are the ordinary cure.

GARGNAGO, in *Geography*, a town of Italy, in the department of the Benaco, on the left bank of the Garda lake; 21 miles N.E. of Breſcia.

GARGONZA, a town of Etruria; 14 miles S.W. of Arezzo.

GARHA, a river of Hindooſtan, which runs into the Chumbul, three miles N.E. of Suiſſopour, in Agimere.

GARHANA, in *Ichthyology*, a name by which ſome have called a large Braſilian fiſh, of the ſhape of our carp, more uſually known among authors by its Braſilian name *Acaraaya*.

GARIA, in *Geography*, a town of Perſia, in the province of Irak; 65 miles S.E. of Hamadan.

GARIA *Bay*, a bay on the ſouth coaſt of Newfoundland; 22 miles E. of cape Ray.

GARIAN, a town of Africa; 37 miles S. of Tripoli.

GARICON, in the *Materia Medica*, a name given by the Arabian writers to the drug called agaric by the ancients.

The Arabians have ſaid nothing of this drug, but what they have tranſcribed from the Greek of Dioſcorides and others; it is certain, however, from the concurrent teſtimony of all the ancients, as to the form, nature, and virtues of agaric, that their's was not the ſame ſubſtance which we call by this name.

The ancients knew two kinds of what they call agaric; they diſtinguiſhed theſe by the common terms of male and female; the male was a root reſembling the ſilphium of a cubit long, and of an inch or two in diameter; the female was the corrupted wood of certain trees, particularly of the cedar, and other odoriferous woods.

Pliny makes it indeed the decayed wood of the oak, which ſhines like fire in the dark, and calls it the fungus, but this was not the agaric of the Greeks.

The female agaric, or the decayed wood of the cedar, was what they gave as an antidote and cordial: the male, or as others called it, the black agaric, was poiſonous. Dioſcorides places it among the poiſonous roots, and Avicenna condemns it, as hard and unfit for internal uſe; the other, or female agaric, being ſoft, friable, and tender. When it was thus in a great degree, however, it was condemned by the more accurate writers; and Dioſcorides, in particular, condemns the agarics of Cilicia and Galatia as too friable, and of no value: ſo that they ſeemed to fix upon a proper ſtage in the decay, as the neceſſary qualification of good agaric.

GARIDELLA, in *Botany*, ſo called by Tournefort, after his countryman Dr. Garidel, author of a folio hiſtory in French, with many plates, of the plants growing about Aix in Provence, diſpoſed alphabetically, and who claims the firſt diſcovery of the *Garidella* in France. Linn. Gen. 227. Schreb. 306. Willd. Sp. Pl. v. 2. 731. Sm. Prod. Fl. Græc. v. 1. 307. Mart. Mill. Dict. v. 2. Juſſ. 233. Tourn. t. 430. Lamarck Illuſtr. t. 379. Gærtn. t. 118. Claſs and order, *Decandria Trigynia*. Nat. Ord. *Multiſiliquæ*, Linn. *Ranunculaceæ*, Juſſ.

Gen. Ch. *Cal.* Perianth inferior, of five ſmall, ovate, acute, deciduous leaves. *Cor.* Petals none, unleſs the calyx be taken for ſuch. Nectaries five, elongated, equal, with two lips; the outer one divided into two long, linear, obtuſe, flat ſegments; the inner ſhort and ſimple. *Stam.* Filaments moſtly ten, awl-ſhaped, ſhorter than the corolla; anthers erect, obtuſe. *Piſt.* Germens three, ovate, pointed, erect, connected; ſtyles ſcarcely any; ſtigmas ſimple. *Peric.* Capſules three, connected, oblong, pointed, compreſſed, of two valves; their inner ſuture moſt convex. *Seeds* ſeveral, ſhort.

Eſſ. Ch. Calyx of five petal-like leaves. Nectaries five, two-lipped, cloven. Capſules three, connected. Seeds numerous.

Obſ. This genus is very nearly akin to *Nigella*, and what is calyx or petals in one, ought to be deemed ſo in the other. The other parts chiefly differ with regard to number, which in *Nigella* itſelf is irregular and variable.

1. G. *Nigellaſtrum*. Linn. Sp. Pl. 608. Curt. Mag. t. 1266. Figured in Garidel, t. 39. Native of fields in the ſouthern parts of Europe. The root is annual. *Stem* one or two feet high, erect, branched. *Leaves* chiefly in the lower part, finely bipinnatifid, reſembling fennel, but flat. *Flowers* ſolitary at the end of each branch, of a greyiſh hue ſpeckled with purple, and worthy of minute examination. *Fruit* granulated. It is eaſily cultivated like other hardy annuals, but has chiefly curioſity to recommend it.

Dr. Smith ſaw in M. Le Monnier's garden at Verſailles what was conſidered as a new ſpecies of this genus, but of this we have no further knowledge. See Tour on the Continent, ed. 2. v. 1. 75.

GARIGA, ſometimes written *Sariga*, in *Ancient Geography*, a town of Aſia, in Aria. Ptolemy.

GARIGLIANO, in *Geography*, a river of Naples, which runs into the gulf of Gæta, N. lat. 41° 15'. E. long. 13° 45'.

GARINDÆI, in *Ancient Geography*, a people of Arabia Felix, towards the lower part of the Arabic gulf.

GARINISH-POINT, in *Geography*, a cape on the ſouth weſtern coaſt of Ireland, in the county of Cork, being near the ſouthern entrance of Kenmare river, and forming the S. weſtern point of Cuolagh bay. W. long. 9° 58'. N. lat. 51° 37'.

GARIOPONTUS, in *Biography*, a phyſician of the Salernian ſchool, who lived in the eleventh century, according to the teſtimony of Peter Damien, who died in 1072. He is called by various names by different writers; as Warimpotus, Raimpotus, Guaripotus, Garimpotus, &c. All that is known of him is, that he was the author of a work chiefly compiled from the obſervations of his predeceſſors, and eſpecially of Theodore Priſcian; but the ſtyle is extremely obſcure, in conſequence of the intermixture of Greek, Arabic, and Latin words. The following are its different editions and titles: "De morborum cauſis, accidentibus, et curationibus, libri viii." Lugd. 1516, in 4to. Baſil 1536, 8vo. "Paſſionarius Galeni de ægritudinibus à capite ad pedes," Lugd. 1526, 4to. "Ad totius corporis ægritudines remediorum praxeos, libri v." Baſil 1531, 4to. Eloy. Dict. Hiſt.

GARIS, in *Ancient Geography*, a town of Paleſtine, in Galilee, according to Joſephus.

GARISSOLES, ANTHONY, in *Biography*, was born at Montauban in the year 1587. Being intended for the profeſſion of theology, he received a ſuitable education, and made a rapid progreſs in all the elementary ſtudies to which his attention was directed. About the age of twenty-four he was admitted to the exerciſe of his miniſterial functions, and

and appointed paſtor of a church. In 1627 he was nominated to the office of profeſſor of divinity at Montauban, the duties of which he diſcharged with great diligence and fidelity till his death in 1650. He was moderator in the national ſynod held at Charenton in the year 1645. His numerous works are chiefly theological; but he was diſtinguiſhed alſo as a Latin poet. His principal poem was entitled "Adolphidos, ſive de bello Germanico, quod incomparabilis heros Guſtavus Adolphus et pro Germaniæ procerum et ſtatuum libertate geſſit." This was an epic poem, in twelve books, and is highly commended for its conſtruction and variety of images, noble ſentiments, and elegant Latinity. Gariſſoles wrote alſo a Latin poem on the coronation of Chriſtina, and another in praiſe of the four proteſtant Swiſs cantons. In teſtimony of their reſpect for his character, and their eſteem of his works, they ſent him in return four ſilver gilt cups, of exquiſite workmanſhip, accompanied with a Latin letter ſigned by the four ſyndics of the four cantons. Moreri.

GARITINA, in *Geography*, a town of European Turkey, in the Morea; 32 miles W. of Argos.

GARIVAN, a town of European Turkey, in Bulgaria, near the Danube; 22 miles S.W. of Driſtra.

GARIZZIM, in *Ancient Geography*, a mountain of Paleſtine, on which ſtood the Samaritan temple, oppoſite to which was mount Ebal, or Hebal; both of which were near the city of Sichem. Theſe two were parted only by a narrow valley of about 200 paces; the former being very fertile, and the latter very barren.

GARLAND, an ornament for the head, made in manner of a crown or chaplet.

The word is formed of the French *guirlande*, and that of the barbarous Latin *garlanda*, or Italian *ghirlanda*. Menage traces its origin from *gyrus*, through *gyrulus*, to *gyrulare*, *gyrlandum*, *ghirlandum*; and at length *ghirlanda*, and *guirlande*; ſo that *guirlande*, and *garland*, are deſcended, in the ſixth and ſeventh degree, from *gyrus*. Hicks rejects this derivation, and brings the word from *gardel handa*; which, in the northern languages, ſignify a *noſegay artfully wrought with the hand.*

Garlands are a ſort of chaplets, made of flowers, feathers, or even of precious ſtones, but eſpecially of flowers; to which the word, in our language, is more immediately appropriated. Janus paſſes in antiquity for the inventor of garlands. Athen. Deipnoſ. lib. xv.

Garlands alſo denote ornaments of flowers, fruits, and leaves intermixed; anciently much uſed at the gates of temples, where feaſts, or ſolemn rejoicings were held; or at any other places where marks of public joy and gaiety were deſired; as at triumphal arches, tournaments, &c. Garlands, or feſtoons, were alſo put on the heads of victims, in the ancient heathen ſacrifices. St. Paulinus, in his poem on St. Felix, does not forget the garlands, and crowns of flowers placed at the door of the church, and on the tomb of that ſaint.

The Italians have a ſort of artificers called *feſtaroli*; whoſe office is, to make garlands, or feſtoons, and other decorations for feaſts.

Garland, in *Mining*, ſignifies a ſpiral groove, made behind or in the ſtoning or ginging of a ſhaft, for collecting the water which oozes out of different ſtrata, to ſome upper level or ſough by which it can be diſcharged, or to a ciſtern from whence it can be pumped up, without deſcending to the bottom of the ſhaft. Sometimes garlands are conſtructed behind the ſtoning or bricking of a mine ſhaft from the top to the bottom, in order to render the ſhaft dry withinſide, which is often a matter of ſufficient importance in preſerving the gin-ropes from decay, &c. to repay amply the care and expence of making ſuch garlands.

Garland alſo ſignifies a broad hoop of iron, or a ſquare frame of wood, which is uſed in coal-pits, to hold on the coals which are laſt heaped on the corves or gang-waggons, employed for conveying the coals from the bark or face of the work, to the bottom of the drawing-ſhaft, and up the ſame to the pit-hills or bank where they are landed, for ſale, or to be put into gang-waggons or trams above ground, to be conveyed to ſome wharf or great town, &c.

Garland, in a *Ship*, denotes a collar of ropes, wound about the head of the main-maſt, to keep the ſhrouds from galling.

Garland is alſo a ſort of net, whoſe opening is extended by a wooden hoop of ſufficient ſize to admit a bowl or platter within it. It is uſed by the ſailors as a locker or cupboard to contain their proviſions, being hung up to the deck, within the birth, where they commonly meſs between decks.

Garland, *Shot*, is a piece of timber nailed horizontally along the ſhip's ſide from one gun-port to another, and uſed to contain the round ſhot ready for charging the great guns in battle. For this purpoſe it is furniſhed with ſeveral ſemi-globular cavities, correſponding to the ſize of the cannon balls contained in it.

GARLICK, in *Botany*, &c. See Allium.

Garlic, *Wild*, a name given to a ſpecies of onion.

Garlick, *Pear*. See Crateva.

GARLIESTON, in *Geography*, a ſea-port town of Scotland, in the county of Wigton, ſituated in a cave of Wigton bay, called "Garlieſton bay." It is of modern date, pleaſantly built in the form of a creſcent, and eſteemed an excellent fiſhing ſtation, with ſafe anchorage; ſix miles S. of Wigton. N. lat. 54° 50′. W. long. 4° 25′.

GARLIN, a town of France, in the department of the Lower Pyrenées, and chief place of a canton in the diſtrict of Pau; 16 miles N. of Pau. The place contains 1000, and the canton 7616 inhabitants, on a territory of 172½ kiliometres, in 29 communes.

GARMOUTH, or Garmach, a burgh of barony in the ſhire of Murray, Scotland, ſtands near the mouth of the river Spey, which here forms a harbour. In this many veſſels are built from the timber out of the contiguous foreſts of Strathſpey and Badenoch. Beſides the ſhipping, and timber trade, Garmouth employs ſeveral ſloops in conveying ſalmon to the London market. The town conſiſts of 304 houſes, and contains about 1200 inhabitants. Moſt of the buildings are conſtructed of clay.

GARN, a town of Sweden, in the province of Upland; 12 miles N.E. of Upſal.

GARNACE, in *Ancient Geography*, a town of Leſſer Armenia, in the diſtrict of Muriana. Ptolemy.

GARNENBERG, a town of Sweden, in Dalecarlia; 5 miles N.E. of Hedemora.

GARNER, a river of England, which joins the Garran, and runs with it into the Wye, 4 miles S.W. of Roſs in Herefordſhire.

Garner, in *Rural Economy*, a term employed to ſignify, in ſome places, a granary, or repoſitory for corn. It is likewiſe applied to a corn-binn.

GARNET, Thomas, in *Biography*, was born at Caſterton, near Kirkby-Lonſdale, Weſtmoreland, on the 21ſt of April, 1766. He received his grammar-ſchool education at a village in the neighbourhood, and was, at the age of fifteen, put apprentice to the celebrated mathematician, Mr. Dawſon of Sedbergh, who was at that time a ſurgeon and apothecary. In the year 1785 he commenced his ſtudies

at Edinburgh, where he took the degree of M.D. in 1788. He thence repaired to London, and purfued his profeffional ftudies with great zeal in the chief hofpitals. He fettled as a phyfician at Bradford in Yorkfhire in 1790, and began to give private lectures on philofophy and chemiftry. Here he wrote his treatife on the Horley Green Spa. Bradford did not afford fufficient fcope for his practice, and in 1791 he removed to Knarefbrough, fpending the fummer at Harrowgate, and the winter at that place: and in 1791 and 92 he publifhed an analyfis of the different waters of Harrowgate. Whilft at Harrowgate his reputation greatly increafed, and he refolved to leave his refidence for a field ftill more calculated to forward his views; and with this opinion he determined to fail for America. While waiting to take his paffage at Liverpool, however, he was folicited to unpack his apparatus, and to deliver a courfe of lectures there; with which he complied, and gave great and general fatisfaction, and his fame fpread around, infomuch that he was afterwards induced to repeat his courfe at Manchefter, Warrington, and Lancafter. He was alfo invited to lecture at Birmingham and Dublin, when he was informed of the vacancy at Anderfon's Inftitution at Glafgow, the profefforfhip of which was handfomely offered to him, and he began his lectures there in Nov. 1796. In 1798 he began his tour to the Highlands, an account of which he publifhed in 1800. At the formation of the Royal Inftitution in London, Dr. Garnet was invited by count Rumford to become the lecturer; he accepted the appointment, and the lecture-room was crowded with perfons of the firft diftinction and fafhion. From the time of his arrival in London, however, he turned his thoughts to the practice of his profeffion, as likely to afford the moft permanent means of fupport; but his plans and profpects were all terminated by death on the 28th of June, 1802. A pofthumous volume, entitled "Zoonomia," was publifhed for the benefit of his orphan family. See the preface to that work.

Garnet, in *Mineralogy*, a fpecies confidered as fubordinate to the filiceous genus of foffils. The fubftances that compofe it exhibit a remarkable fimilarity of external form, united, however, to great difparity in colour, and particularly in the nature and ~~proportion~~ of their component parts. Hence feveral attempts have been made at fubdividing this affemblage, and fome lately difcovered fubftances, obvioufly belonging to the garnet, have been introduced under new names, and as diftinct fpecies. Haüy, conformably to the principles of his fyftem, has confolidated under the fpecific name of *grenat*, the various fubftances defcribed as precious and common garnet, almandine, pyrope, colophonite, topazolete, fuccinite, and melanite. Werner's divifion of this fpecies into the two fub-fpecies of *noble* and *common* garnet, though it may not draw a perfect line of demarcation between the two fubftances, is ftill of practical utility, and partly founded on chemical and geological obfervation. We fhall adopt the fame divifion, but add likewife, as fub-fpecies, the pyrope and melanite, both of which, from geognoftic confiderations, are introduced as diftinct fpecies into the Wernerian fyftem. The uniting into one mafs extenfive fuites of fubftances of various appearance and compofition, merely becaufe we difcover the fame type of cryftallization in them, is often productive of great inconvenience to the ftudent; and the fame may be faid of the oppofite practice of founding fpecific diftinctions on characters not fufficiently important. With regard to the garnet, it is for repeated chemical analyfis to affift in determining what rank the fubftances enumerated under the following fub-fpecies may hereafter occupy in the fyftem. The chemical diftinction afforded by the prefence of a greater proportion of lime in the common garnet and the magnefia as a conftituent part of the pyrope-garnet, though it may affift in, is ftill much too vague entirely to regulate, the diftribution of the granatine fubftances.

Sub-fpecies—1. *Noble Garnet.*—*Almandine*, Karften. *Oriental garnet.*—*Grenat oriental*, *furian*, *firien*, *&c.* Colour cherry and blood-red, of various intenfity, paffing on one fide into dark crimfon and columbine red, in which the blue often confiderably predominates; and on the other into hyacinth-red and reddifh yellow.

It is fometimes found maffive and diffeminated, but generally cryftallized. The principal modifications of the cryftals are,

1. The rhomboidal dodecahedron, alfo denominated the garnet-dodecahedron, and which is at the fame time the primitive form. It is fometimes found elongated in fuch a manner that fix of its planes, taking the form of oblique-angled parallelograms, conftitute the lateral planes of a fix-fided prifm, while three planes at each end preferving their rhomboidal form, may be confidered as acuminating planes fet on the alternate lateral edges of the prifm. (Grenat primitif alongé, Haüy.)

2. The primitive cryftal having each edge intercepted by a fingle plane. This modification has 36 planes, 12 of which are rhombs, and 24 hexagons. (Grenat emarginé, Haüy, pl. 46. fig. 57.) It forms the tranfition into

3. The leucite cryftallization, or roundifh cryftal with twenty-four equal, trapezoidal planes; which is defcribed alfo as a low, double, eight-fided pyramid, with the lateral planes of the one fet on the lateral planes of the other, and having each fummit acuminated by four planes fet on the alternate lateral edges. (Grenat trapezoïdal, Haüy, pl. 46. fig. 56.)

What is defcribed as leucite cryftal, in which the angles formed by the meeting of the different trapezoidal planes are truncated, is a variety of modif. N° 2. in which the rhombs are much fmaller than the hexagons.

4. The garnet dodecahedron having each of its edges intercepted by three planes, or modif. N° 2, increafed by 48 planes between the rhombs and hexagons, (Grenat triémarginé, Haüy, pl. 46. fig. 58.)

5. Modific. N° 2, augmented by 24 planes; all the edges formed by the meeting of four hexagons being intercepted each by a narrow plane. (Grenat uniternaire, Haüy, pl. 46. fig. 59.)

Thefe modifications do not exclufively belong to the noble garnet; they all occur, though more rarely, in the common garnet, and at leaft, N° 1 and 2, in the melanite garnet.

The cryftals are found of all fizes, from that of the head of a fmall pin to that of a clenched fift, and upwards; the latter belonging always to this fub-fpecies, and generally to Mod. N° 1. and its elongated variety. They are found imbedded or loofe, not in drufes. Their furface is generally fmooth, but not feldom furnifhed with ftriæ or furrows indicative of the decrement of the laminæ on the rhomboidal primitive planes.

While the external luftre of the cryftals and grains varies according to circumftances, that of the interior is conftantly more or lefs fplendent; it is between vitreous and refinous.

Its fracture is generally perfectly conchoidal, approaching fometimes to uneven and fplintery; and in fome cafes it has been obferved to border on foliated. Fragments indeterminately angular, more or lefs fharp-edged; but the maffive noble garnet, efpecially that from Norway, is generally compofed of fine or coarfe-grained concretions, producing, in the

the transparent varieties, the appearance of innumerable flaws.

Its transparency varies from perfectly transparent to translucent at the edges only; and a slight degree of cloudiness is observed even in the purest.

It is harder than quartz, and its hardness appears to be in a ratio with its purity and transparency.

It is brittle, and easily frangible.

Specific gravity greater or less according to the varying proportion of iron it contains: 4.352, Karsten.—4.230, Werner.—4.135, Gellert.—4.085, Klaproth.—4.188, Brisson.—3.889 (that of Greenland), Lichtenberg.

The chemical characters of the noble garnet are not easily seized. It is fusible before the blow-pipe, but requires a high degree and long continuance of heat. In the charcoal crucible it melts into a grey turbid glass; and 100 grains, thus fused, without any addition, yielded to Klaproth a globule of iron of 23 grains.

We possess the following analyses of the noble garnet.

Klaproth.	
Silica	35.75
Alumina	27.25
Oxyd of iron	36.0
Oxyd of manganese	0.25
Loss	0.75
	100

Vauquelin, according to Haüy, found 102 parts of what he terms the trapezoidal red garnet of Bohemia to contain, silica 36, alumine 22, lime 3, oxyd of iron 41; and the composition of small dodecahedral red garnet crystals, from Eres-lids, near Barège, the same distinguished chemist states to be silica 52, alumine 20, oxyd of iron 17, lime 7.7, loss 3.3.

The list of the localities of the noble garnet, as it is given in the systems of Mineralogy, is not to be depended upon; most of the writers confounding this with some varieties of the other sub-species: nor is it of any avail barely to know that a mineral is found in Pegu, Ceylon, &c. if we remain ignorant respecting the mode in which it occurs there. The lapidaries have much contributed in this respect to lead the mineralogist into error. Their custom of dignifying by the term of "oriental" every stone they consider of superior quality, is too well known to mislead; and we suspect that the epithet *Surian* or *Syrian*, given to the noble garnet (but which is probably derived from *Soranus*, a name applied in the middle ages to some red stone or other), has first caused Syria, and afterwards Pegu (a town of which is called Sirian) to be introduced into the list of the localities of this stone. Of the places in Europe where the noble garnet is found, the following may be mentioned: Norway; Sweden (Fahlun, Graperberg); Greenland; Scotland (Aberdeenshire, Rossshire, and the Long island); Siberia; Saxony (Zöblitz, Galenz); Silesia (Querbach, &c.); Bohemia; Tyrol (Zillerthal, &c.); Stiria (Stubner Alps, &c.); Switzerland; France, &c.

This sub-species is a production of the primitive mountains: it is found in mica slate, chlorite slate, in hornblende and serpentine. In gneiss and granite it occurs but seldom. It is never found as the production of any particular mineral repository, such as veins or beds.

The noble garnet is polished and cut like the more valuable precious stones, and used for ornamental purposes. There are also some engravings to be seen in it, both modern and ancient. Of the latter we mention *instar omnium*, the Dog-Sirius, by ΓΑΙΟΣ, the greatest master-piece existing in point of deep work and finish, which is in the collection of the duke of Marlborough, and is said to be in garnet.

Observations.—1. The noble garnet from Greenland, consisting of curved lamellar concretions, has been hitherto found only massive, in rolled and indeterminately angular pieces.

2. Champeaux describes amorphous and rounded pieces of noble garnet, of the size of a pigeon's egg, forming tubercles in a white indurated talc found in the mountains of Courson, above Trascuaire, in the Simplon.

3. Noble garnets and pyrope garnets, that have, by decomposition, lost their natural colour and become friable, are sometimes improperly called *unripe garnets*.

4. The primitive form of the garnet is exactly the same as that of the cells of bees: the polyhedron exhibited by these two bodies is that which offers most capacity with the least surface. Haüy.

Sub-species 2.—*Pyrope Garnet; Pyrope,* Werner; *Bohemian garnet.* It has not yet been found crystallized, but only in small and middle-sized angular and rounded pieces. Its colour is intensely blood-red, appearing blackish red in the larger pieces. Internally its lustre is strong: it is splendent and vitreous. Its fracture is conchoidal, more perfectly so than that of the noble garnet: it is completely transparent. Hardness and specific gravity between those of the common and noble garnet: sp. gr. 3.941, Werner; 3.718, Klaproth.

Its chemical character is nearly that of the noble garnet; from which it differs, however, according to Klaproth's analysis, in having magnesia for one of its component parts

Silica	40.00	
Alumina	28.50	
Magnesia	10.00	
Lime	3.50	
Oxyd of iron	16.50	
Oxyd of magnesia	0.25	
Loss	1.25	
	100	Klaproth's Beitr. vol. ii.

The pyrope is almost entirely confined to the fletz-trap formation. In the Bohemian middle-mountains (at Meronitz, Podsedlitz, Chrastian, Terzeblitz, &c.) it is found partly immediately below the upper mould, partly in a greenish-grey kind of wacke, and among basaltic boulders and *contritus* of the same, lying immediately under a stratum of marle. At Ely in Fifeshire, Scotland, it is, according to Jameson, found in the sand on the sea-shore, and is probably derived from the neighbouring fletz-trap rocks. At Zoblitz, in Saxony, it is said to occur in serpentine.

The pyrope or Bohemian garnet of the lapidaries, is next in value to that variety of the noble garnet called oriental or Sirien garnet, and is, like it, cut for ring-stones, necklaces, bracelets, &c. It is often a matter of difficulty to distinguish this sub-species from the preceding, when cut; and, indeed, in whatever manner mineralogists may dispose of the pyrope in their systems, the lapidaries can scarcely be expected to separate it from the other precious garnet.

In Bohemia, the pyrope and noble garnets constitute an article of commerce of the greater importance, as they procure a livelihood to an extensive class of people, who have no other means of subsisting than the digging for and manufacturing this article of luxury. A principal place for these garnets is Meronitz, at the Stifleberg; but in still greater abundance they are found at Podsedlitz, Drskowitz, and Trzeblitz, villages in the circle of Leutmeritz, to the west

of the road that leads from Drefden to Prague. At Meronitz they are dug up without further preparation; but at the laft-mentioned places a regular fyftem of mining is adopted for obtaining them. The firft procefs confifts in removing the upper ftratum of mould; after which a fhaft is funk through the marle, where the boulders and the contritus of bafalt appear, the latter of which, being in the form of coarfe blackifh gravel, is fent up in bafkets and kept for ufe. Levels or drifts are then excavated, running in feveral directions from the bottom of the fhaft, and, after having yielded their contents, are again filled up with the boulders and rubbifh.

The next procefs is that of feparating the pyrope garnets from the heterogeneous matter by which they are enveloped; to effect which the bafaltic gravel is put into veffels filled with water, and ftirred for a confiderable length of time; after which the lighter particles are poured off with the water. This procefs is repeated feveral times, till nothing remains at the bottom of the veffel but the heavier pieces of rubbifh with the garnets among them, which latter are carefully picked out by women.

The garnets are next paffed through veffels pierced with holes of various diameter, by which means they are forted into fix different fizes: of the largeft about 32 go to an ounce; the next are thofe of about 40, 75, 110, 165, 265, and 400 to an ounce of Nuremberg weight; while thofe ftill lefs in fize are fold partly to the apothecaries, who ufe them for regulating their fcales; partly to the richer poffeffors of gardens, for ornamenting the walks. Pieces of which 16, 20, or 24 go to the ounce, are rarely feen; though there are a few inftances of pieces having been found of as much as one-fifth of an ounce in weight.

The art of cutting and boring thefe garnets occupies a great number of men. The latter of thefe operations is performed in the following manner: The garnet is properly placed and faftened, after which the diamond, which is fitted up like a glazier's diamond, is placed on the top and rapidly turned by means of a bow. A workman can bore 150 a day.

The larger of the pyrope garnets are cut and polifhed, which is performed with emeril on a difk cut out of fand ftone. A workman generally finifhes thirty in a day. This art, which is of very long ftanding in Bohemia, efpecially at Carlfbad and Turnau, has been carried to the higheft perfection at Freiburg and Waldkirch, two towns in Suabia, the latter of which has no lefs than twenty-four mills, and 140 mafters occupied in the manufacturing of this article of commerce.

Sub-fpecies 3.—*Common Garnet*; *Silex Granatus vulgaris*; *Roche de Grenat*, &c.—Its colour is chiefly green and brown of various fhades; the former occurs as olive, leek, mountain, piftachio, and grafs green, and alfo paffes into greenifh-grey; while the latter, as liver, reddifh, and yellowifh-brown, paffes into brownifh and hyacinth red, and rarely into orange and ifabel, or cream yellow. Both the brown and green varieties appear fometimes nearly black.

It generally occurs maffive and diffeminated, feldom as imbedded grains, but frequently cryftallized. The cryftals affume all the forms belonging to the noble garnet; but they are almoft conftantly aggregated and formed into drufes. They feldom furpafs the middle fize, but are ufually fmall.

Internally the common garnet is more or lefs gliftening; luftre between refinous and vitreous.

Fracture uneven, coarfe, and fmall-grained, fometimes approaching to fplintery, and alfo to fmall conchoidal. Fragments indeterminately angular, not particularly fharp edged. When maffive it often appears to confift of coarfe or fine-grained concretions, of various degrees of cohefion, fometimes perfectly friable.

It is feldom femi-tranfparent, generally more or lefs tranflucent, often only at the edges, fometimes completely opaque. Hardnefs inferior to that of the noble and pyrope-garnet; it is brittle and eafily frangible.

Specific gravity 3.737 (green var. from the Bannat) Werner; 3.754 (green, from the Teufelftein near Schwarzenberg) id.; 3.668 (green var. from Sweden) Karften.

The common garnet yields much fooner to the fire than the noble. Before the blow-pipe it lofes its colour and melts without difficulty. The green, before it melts, generally turns grey.

Conftituent parts.—The green garnet from the Ehrenberg at Ilmenau contains, according to

	Wiegleb	and Merz,
Silica	26.46	40
Alumine	22.70	20
Lime	17.91	8
Iron	16.25	20
Lofs	16.68	12
	100	100

Voigt's Min. u. Bergm. Abh. vol. i.

The confiderable deficit in both thefe analyfes is remarkable.

The refult of Klaproth's analyfis of the olive-green garnet, from the river Wilui, in Siberia, is

Silica - - - -	44
Lime - - - -	33.50
Alumine - - - -	8.50
Oxyd of iron - - -	12
—— of manganefe (a trace only).	
Lofs	2
	100

Klapr. Beitr. vol. iv.

The pitch garnet of Karften, defcribed by fome mineralogifts under the name of *Colophonite*, but which is nothing but common garnet of a yellowifh-brown colour, generally occurring in diftinct granular concretions, confifts, according to M. Simon, of

Silica	35
Alumine	15
Lime	29
Magnefia	6.5
Iron	7.5
Manganefe	4.75
Oxyd of Titane	0.5
Water	1
Lofs	0.75

Bulletin des Sc. Apr. 1808.

From the Danifh Naturh. Selfkap Skrifter, vol. ii. n. 2. it appears that Prof. Becker found 200 grains of the green garnet from Norway to confift of filex 78, iron $64\frac{1}{2}$, alumine 14, lime 42; the lofs being $1\frac{1}{2}$.

Wiegleb, an accurate chemift, who examined the green common garnet, from the Teufelftein in Saxony, could not difcover a veftige of alumine in that variety.

Its principal localities are Saxony, (Schwarzenberg, Ehrenfriederfdorf, Berggiefhübel, Schneeberg, Geier, &c.); Silefia; Bohemia (in feveral parts); Hungary (Dognatzka, Orawitza,

Orawitza, Wadarna, Saſka, Dobſchau); Saltzburg (Zillerthal, Thal-Achen, mountains of Brennthal, &c.); Tyrol (Schwatz); Norway (var. called Colophonite, and others); Sweden (Garpenberg, Fahlun, Dannemora); Siberia; Ireland; Kamtſchatka (fine bright green variety.)

The geognoſtic ſituation of the common garnet is that in beds, in the older primitive rocks, where it occurs partly maſſive, partly cryſtallized in druſes; and it is (contrary to what we know of the noble garnet) but ſeldom ſeen diſſeminated in, or mixed with, other rocks. Sometimes it forms entire beds by itſelf, for inſtance in the Saxon and Bohemian Ertzgebirge, &c. It accompanies various ores, ſuch as copper and iron pyrites, magnetic and red iron ſtone, galena, blende, &c. It occurs with epidote, with ſahlite, and other varieties of pyroxene, in the iron mines of Norway; with table-ſpar, tremolite, calcareous ſpar, &c. at Dognatzka, and in other places of the Bannat.

The uſes to which the common garnet is applied are by no means various. In ſome countries where the green variety is found in abundance, it is, on account of its eaſy fuſibility, and of the conſiderable portion of iron that enters into its compoſition, advantageouſly employed as a flux in the ſmelting of iron ores.

Obſervations.—1. The brown variety often reſembles tin ſtone, and is by ſome called tin garnet; whence, probably, the miſtaken notion ſo often repeated by authors, that tin enters into the compoſition of ſome garnets.

2. The *Hyacinthe la belle*, conſidered by ſome as a variety of the common garnet, is (if we have the right ſpecimen before us) the lighteſt reddiſh-yellow variety of the noble garnet.

Subſpecies 4.—*Melanite Garnet; Black Garnet.*—Colour deep or velvet-black when freſh; worn off it becomes greyiſh-black.

It occurs cryſtallized; cryſtals thoſe of N° 1, and particularly of N° 2, of the noble garnet; they are middle-ſized and ſmall. The rounded pieces are the ſame, only diſturbed in their developement. Externally they are more or leſs ſmooth and ſhining; internally gliſtening.

Fracture imperfectly ſmall conchoidal. Fragments indeterminately angular, ſharp-edged.

It is perfectly opaque, not particularly hard, but very brittle. Specific gravity 3.800, Werner; 3.691, Karſten.

Conſtituent parts, according to Klaproth's analyſis,

Silica	35.5
Alumine	6
Lime	32.5
Oxyd of iron	25.25
Oxyd of mangaueſe	0.4
Loſs	0.35
	100

Bullet. des Sc. 1808.

The melanite has been found at Fraſcati near mount Veſuvius, imbedded, as it is ſaid, in a baſaltic maſs, which alſo includes feldſpath, Veſuvian, and hornblende; the looſe cryſtals are generally picked up in the fields of the ſame neighbourhood, as alſo about Rome. Near mount Somma it occurs imbedded in a calcareous rock, according to Breiſlak. It is likewiſe found in Bohemia in the Brenzlau-circle, and near Teplitz; for, from the deſcription given by Reuſs (in Sammlung Nat. Hiſt. Aufsätze, p. 307), the two foſſils occurring there in baſalt, the one accompanied by hornblende and augite, the other by common olivine, mica, and calcareous ſpar, appear to agree in all the eſſential characters with the Italian melanite.

Whether the black garnet of Eres-lids, analyſed by Vauquelin, belong to this ſub-ſpecies, remains ſtill to be determined. It conſiſts of ſilica 43, alumine 16, lime 20, oxyd of iron 16, and water 4.

The mineral ſubſtance from Arendal in Norway, deſcribed by Mr. Ingverſen as melanite, is, by Mr. Emmerling, ſuſpected to be nothing but augite (Pyroxène, Haüy.)

GARNET, in a *Ship*, is a tackle having a pendant coming from the head of the main-maſt, with a block ſtrongly ſeized to the main-ſtay, juſt over the hatch-way; in which block is reeved the runner, which hath a block at one end, in which are hitched the ſlings; and at the other end is a double block, in which the fall of the runner is reeved; ſo that by its means any goods, or caſks, that are not over heavy, may be haled and hoiſed into, or out of the ſhip: when this garnet is not uſed, it is faſtened along by the ſtay at the bottom of it.

GARNET, *Clew.* See CLEW-*garnet.*

GARNIER, ROBERT, in *Biography*, was born in 1545 at La Ferte Bernard, in Maine. He was educated for the profeſſion of the law, and attained to conſiderable rank in that line, but in his advanced years Henry IV. created him a counſellor in his grand council. He died at Mans in the year 1601. He was attached to poetry in his youth, and while ſtudying at Toulouſe obtained a prize in the Floral games of that city. He was afterwards known as a writer of tragedies, and is conſidered as one of the creators of the French theatre. Moreri.

GARNISH, in ſome ancient writings and ſtatutes. To garniſh the heir ſignifies to warn the heir. 27 Eliz. cap. 3.

GARNISHEE, in *Law*, the party in whoſe hands money is attached within the liberties of the cities of London; ſo called in the ſheriff's court, becauſe he has had garniſhment, or warning, not to pay the money, but to appear and anſwer to the plaintiff-creditor's ſuit.

GARNISHING is popularly uſed for the furniture, aſſemblage, or ſortment, neceſſary for the uſing or adorning any thing.

The word is French, formed of the verb *garner*, to furniſh, or fit out.

The garniſhing of a diſh conſiſts of certain things which accompany it, either as a part and ingredient thereof; in which ſenſe pickles, muſhrooms, oyſters, &c. are garniſhing: or as a circumſtance, or ornament; as when leaves, flowers, roots, &c. are laid about a ſervice to amuſe the eye.

The ſame word is uſed for the finer herbs, fruits, &c. laid about a ſallad: garniſhings are of lemon, piſtachios, pomegranate, yolks of hard eggs, artichoke-bottoms, capers, truffles, ſweet-bread, &c.

GARNISHMENT, in *Law*, denotes a warning given any one to appear, for the better furniſhing of the cauſe, and court. Thus, if one be ſued for the detinue of certain charters; and ſays, they were delivered to him, not only by the plaintiff, but by J. S. alſo; and therefore prays, that J. S. may be warned to plead with the plaintiff, whether the conditions are performed or not. In this petition he is ſaid to pray garniſhment; which may be interpreted, a warning to J. S. to provide himſelf for a defence; or elſe a furniſhing the court with all parties to the action, whereby it may thoroughly determine the cauſe.

GARONNE, in *Geography*, a river of France, which riſes in the Pyrenées, and joining with the Dordogne, about 12 miles below Bourdeaux, changes its name to Gironde.

GARONNE,

Garonne, *Upper*, one of the departments of France, in the S.W. or Garonne region, formerly Upper Languedoc, in 43° 20′ N. lat. is bounded on the N. by the department of the Lot, on the N.E. by the department of the Tarn, on the S.E. by the departments of the Aude and the Arriege, on the S. by Spain, and on the W. by the departments of the Upper Pyrenées and the Gers. It takes its name from the river Garonne, which paffes through it. Its capital is Touloufe. Its extent is 8,077½ kiliometres, or 408 fquare leagues, and it contains 432,263 inhabitants, in five diftricts *viz.*: Caftel-Sarrazin, including 66,397 inhabitants, on 1,220 kiliometres, and 86 communes; Touloufe, having 126,140 inhabitants, on 1,695 kiliometres, and 142 communes; Villefranche, containing 53,356 inhabitants, 955 kiliometres, and 99 communes; Muret, including 78,905 inhabitants, 1,800 kiliometres, and 130 communes, and St. Gaudens, having 107,465 inhabitants, 2,407½ kiliometres, and 234 communes. Its contributions amount to 4,554,341 francs, and the expences charged upon it for adminiftration, juftice, and public inftruction, amount to 432,316 fr. 66 cent. This department, lying between Lot and the frontier of Spain, confifts of hills, and tolerably fertile plains; producing grain, fruits, wine of an indifferent quality, paftures, and confiderable forefts, with quarries of marble, and mineral fprings.

Garonne and *Lot*. See Lot and *Garonne*.

GAROSMUS, in *Botany*, from γαρον, *garum*, the liquor of pickled fifh, and οσμη, *a fmell*. Dodoen. Pempt. 616. A name very well applied by Valerius Cordus to the *Chenopodium olidum*, Fl. Brit. 277. Engl. Bot. t. 1034, whofe intolerable fetor, when the plant is touched, refembles corrupted falt-fifh. Lobel relates a ftory of its being peculiarly attractive to dogs.

GAROUAI, or Garovay, in *Geography*, a town of Africa, on the Grain coaft, on the river St. Clement.

GARRA, Lana, or *Neratte*, in *Ancient Geography*, a town of Mauritania Cæfarienfis, mentioned by Ptolemy; it was fituated towards the N.E. of Victoria, and had been epifcopal.

GARRACHICA, in *Geography*, a town of the ifland of Teneriffe, which had formerly been a fea-port; but the harbour being deftroyed by an earthquake and eruption of the volcano on the peak in 1704, the houfes are now built where the fhips lay at anchor.

GARRACOURY, a town of Hindooftan, in Marawar; 20 miles S.S.E. of Trumian.

GARRAF, town of Spain, in Catalonia, near the fea-coaft; 10 miles S.W. of Barcelona.

GARRAN, a river of England. See Garner.

GARRARD, a county of Kentucky, in America, S.E. of Madifon county, on the fouth fide of Kentucky river.

GARRAWAY, a town of Africa, on the Slave coaft. N. lat. 4° 10′. W. long. 8°.

GARREFIO, a town of France, in the department of the Stura; 9 miles S.W. of Ceva.

GARRETS, the uppermoft rooms of a houfe in whole or in part in the roof. When the roof comes very low in the garrets, the angles are cut off by afhlering, fo as to have a confiderable upright on the fides.

GARRET-DENNIS, in *Geography*, an ifland in the eaftern Pacific ocean, about 42 miles in circumference, inhabited by blacks, who are armed with lances, bows, and arrows; fituated to the north of New Ireland. S. lat. 2° 30′. E. long. 151° 25′.

GARRIA, in *Ancient Geography*, an epifcopal town of Africa, in the Byzacene territory.

GARRICK, David, in *Biography*, was born in Hereford in the year 1716. He was defcended from a French family, who fled to England on the revocation of the edict of Nantes. His father was a captain in the army, and ufually refided at Litchfield, but at the time of David's birth he was, in the duties of his profeffion, at Hereford. The youth was educated partly at the grammar-fchool at Litchfield, and partly under the celebrated Dr. Johnfon. He was in very early life diftinguifhed by his fprightlinefs, and by a great paffion for the drama. When he was but eleven years of age, he engaged his young companions to affift in getting up and acting the Recruiting Officer, in which he took the part of ferjeant Kite. It was not till he was about nineteen years old, and after he had made a trial in bufinefs, that he was placed under Dr. Johnfon to improve in polite literature. At this period the love of the ftage had taken fuch firm poffeffion of the mind of young Garrick, that it left little room for claffical ftudies, and he was writing fcenes in comedies, of his own invention, when he ought to have been compofing fcholaftic exercifes. Whatever might have been his youthful failings, he had the addrefs to ingratiate himfelf with his tutor, and they travelled together to the metropolis about the year 1737. Garrick was at firft fent to refide with Mr. Colfon, an eminent mathematician at Rochefter, with the intention of obtaining fome general knowledge previoufly to entering at the Temple. After this, by a change of circumftances in his family, he entered into partnerfhip with his brother in the wine trade, which he foon relinquifhed with a determination of following his favourite plan of becoming an actor by profeffion. In 1741 he began a fummer's campaign at Ipfwich, and played a variety of parts with uniform fuccefs. From Ipfwich he came to London, and in October of the fame year he made his appearance at the theatre in Goodman's Fields. He chofe for his firft part the character of Richard III. as one that would not require a dignity of perfon which he did not poffefs; while it would give fcope to all thofe ftrong marks and changes of paffion in which his principal excellence ever confifted. His natural mode of recitation, though a novelty in tragedy to a London audience, produced its intended effect, and never was an audience betrayed into more hearty and unfeigned applaufe. The part was repeated for feveral fucceffive nights, and was followed by others both in tragedy and comedy; "and fuch," fays a critic, "was the blaze of fame attending the new actor, that the eftablifhed theatres were deferted, and ftrings of carriages from the polite part of the town thronged the ftreets of the city." While he was at Goodman's Fields he appeared as a dramatic writer in two pieces, entitled "The Lying Valet" and "Lethe," which were well received, and which are ftill occafionally acted. In 1742 he was drawn over to the theatre at Drury Lane, and at the clofe of the feafon he went to Dublin, where he was received with an admiration bordering upon extravagance. Here the theatre was fo crowded that an epidemic difeafe, which broke out in that capital, was called the Garrick fever. Upon his return to London he took up fome new parts, and among others that of Abel Drugger, in which he excited great furprize, by banifhing from one of the moft lively and expreffive countenances every veftige of fenfe, and putting on the ftare of ftupidity. By this theatrical degradation he is faid to have wrought an unlucky cure in a young lady of fortune who had fallen in love with him in the characters of Chamont and Lothario. No actor, it is fuppofed, ever more thoroughly adopted, for the time, the characters which he fuftained; and his attention to propriety was uniformly

uniformly supported by every look and gesture while he continued in sight of the audience, whether speaking or silent. In the spring of 1747 he commenced his career as a theatrical manager. He was admitted as an equal partner, and on moderate terms, with Lacy the patentee. The two managers wisely took different provinces: that of Lacy was the care of the scenes, and the domestic economy, while Garrick superintended the choice of plays, the distribution of parts, and the treaties with authors and actors. The theatre was opened in September 1747, with a prologue by Mr. Johnson. This was the prelude of a better era of dramatic exhibitions; in particular it ushered in the revival of a number of Shakspeare's plays, freed from the tasteless and incongruous additions which had been made to them by the writers of the past century. Garrick was the living commentator of the great dramatist, and by the force of his action he called forth all the latent beauties of the author, and excited in the audience ideas which might otherwise for ever have escaped their notice.

In 1749 Garrick entered into the marriage life with Mademoiselle Violetti, who had been a dancer on the stage, but who had borne a most irreproachable character. The union was a source of mutual felicity till it was dissolved by death. In his character of manager he was frequently engaged in unpleasant controversies with authors, though it is admitted on all hands that his treatment of dramatic writers was more liberal than that of former managers. He, however, sometimes passed a judgment upon works which the event proved to be erroneous, nor was he disposed to revoke a sentence once given. But in general he kept on good terms with the most respectable writers, and received from many of them that praise, to attain which seemed almost the chief object of his life. By the public, Garrick was sometimes censured as parsimonious, with respect to the providing of those ornamental decorations and splendid exhibitions, which are as necessary to please the eye, as the more rational part of the entertainment is to satisfy the judgment.

In 1763 our author and actor resolved to relax from his great cares and fatigues in a tour to the continent. Accompanied by his wife, from whom he was inseparable, he visited several parts of Italy and France, and met with flattering notice from many persons of distinction. At this time Mademoiselle Dumesnil was the favourite actress in Paris, but Garrick, without hesitation, ventured to foretel that Clairon would excel all her competitors, and the result verified his predictions. Garrick returned after an absence of 18 months, and was welcomed with raptures. The prologue spoken by him on his first night was one of the happiest efforts of the kind, and he was obliged to repeat it 10 successive nights. He was thought to be even improved in his style of acting, and likewise in his general knowledge of drama; and in 1766 he brought out the comedy of "The Clandestine Marriage," the joint production of himself and Colman. An important event in the life of Garrick was the celebration of the Shakspeare jubilee. A mulberry-tree, planted at his native town, Stratford-upon-Avon, by the immortal bard, being cut down, the wood of it was converted into a number of toys and implements, which were eagerly purchased. The corporation of the town presented to Garrick the freedom of the place in a box made from the wood of the tree, as a proper compliment to one who had done the poet so much honour. This incident suggested to him the idea of a festival in commemoration of Shakspeare, upon the very spot where he was born, and the idea was put into execution in the autumn of 1769. Temporary buildings were raised for the occasion, and various entertainments were planned to suit a variety of tastes. Company of almost all ranks, and from distant parts of the kingdom, assembled to celebrate the memory of the poet. The jubilee lasted three days, but the weather was exceedingly unfavourable, and the pleasure enjoyed was by no means equal to that which the enthusiastic admirers of Shakspeare had anticipated. Nevertheless Garrick, who was the soul of the festival, exerted all his talents to gratify both the eye and the understanding. He composed several songs for music, and an ode of considerable length to the honour of his hero. Here he expended a considerable sum of money, and in the winter he took a method of reimbursing himself. "The jubilee was made a theatrical exhibition, which became so popular that it was represented, night after night, for more than half the season, to crowded audiences."

In 1773 the death of Mr. Lacy threw the sole management of the theatre on Mr. Garrick, but his health was on the decline, and the period of his life ill adapted to additional labours. He continued, however, in the discharge of his professional duties some time longer, and rendered an essential service to the profession, which he had dignified, by perfecting the plan of an institution for the relief of decayed actors, and he contributed to its fund with much liberality. At length he determined on his retreat, and in January 1776 he parted with a moiety of the Drury-lane patent for the sum of 35,000*l.* The last character in which he appeared was Don Felix in the "Wonder," for the benefit of the theatrical fund. At the conclusion of the play he made a brief farewel address to the audience, which the genuine feelings of regret on both sides rendered truly pathetic; and few persons ever quitted a public station with more deserved plaudits. About Christmas, 1778, being upon a visit at the seat of earl Spencer, he was seized with some alarming symptoms, which induced him to hasten to London. He died on January 20, 1779, and his remains were interred with great pomp in Westminster-abbey, attended by many persons of the first distinction in rank and talents. The whole life of Garrick was active, and full of occurrences, which cannot in this sketch be given with any degree of precision. He continued, however, in the unmolested enjoyment of his fame and unrivalled excellence to the moment of his retirement. He never had a competitor. Tragedy, comedy, and farce, the lover and the hero, the jealous husband who suspects his wife without cause, and the thoughtless lively rake who attacks without design, were all alike his own. Rage and ridicule, doubt and despair, transport and tenderness, compassion and contempt; love, jealousy, fear, fury, and simplicity, all took, in turn, possession of his features, while each of them appeared, on the proper occasion, to be the sole possessor of his heart. In short, Nature, the mistress from whom alone this great performer borrowed all his lessons, being in herself inexhaustible, this her darling son appeared as her truest representative, and found an unlimited scope for change and diversity in his manner of copying from her various productions. There is one part of his theatrical conduct which ought to be recorded to Garrick's honour, since the cause of virtue and morality, and the formation of public manners, are considerably dependent upon it; and that is, the zeal with which he aimed to banish from the stage all those plays which carry with them an immoral tendency, and to prune from those which do not absolutely, on the whole, promote the interests of vice, such scenes of licentiousness and liberty as a redundancy of wit and too great liveliness of imagination have induced some of our comic writers to indulge themselves in, and to which the sympathetic disposition of the age has given sanction.

Garrick was in character a man of the world, whose vivacity and apparent volatility did not interfere with the steady

pursuit.

pursuit of fame and fortune. In this he was guided by great good sense and discretion, and a spirit of order and economy. He has been reproached with the imputation of avarice; but his mode of living was hospitable and generous, and his bounty frequently flowed in a large stream of munificence. His principal foible was vanity, which made him inordinately fond of adulation, as he was impatient of censure and ridicule. This propensity rendered him culpably jealous of rivals, and he is charged with endeavouring to keep down those rising talents from which he feared competition. In his commerce with the great he was attentive and respectful, yet with freedom enough to make him an excellent companion. As an actor, it seems to be allowed that none ever surpassed him in the truth and nature with which he identified himself with the fictitious object of his representation, so that he seemed to have darted his soul successively into all the forms which he assumed. This faculty he displayed equally in the most comic and the most tragic parts, and it has scarcely yet been decided in which of the two his chief excellence lay. His voice and his eye were calculated for every possible expression of mental feeling. Expression, indeed, was his great strength, and the parts in which he best succeeded were those in which passion most predominated. In the enunciation of calm sentiments, decorated by poetical language, he had superiors. His literary talents were respectable; he composed some smart epigrams, many pleasant and well adapted prologues, entertaining and dramatic pieces, and lively poems of the humorous and familiar class.—Davies' Life of Garrick.

GARRIDER, in *Geography*, a town of Hindoostan, in Guzerat; 60 miles W.S.W. of Gogo.

GARRISON, in the *Art of War*, a body of forces disposed in a fortress, to defend it against the enemy, or to keep the inhabitants in subjection, or even to be subsisted during the winter season.

Du-Cange derives the word from the corrupt Latin *garnisio:* which the later writers used to signify all manner of munition, arms, victuals, &c. necessary for the defence of a place, and the sustaining of a siege.

Garrison, and winter quarters, are sometimes used indifferently for the same thing; and sometimes they denote different things. In the latter case, a garrison is a place wherein forces are maintained to secure it, and where they keep regular guards; as, a frontier town, a citadel, castle, tower, &c. The garrison should always be stronger than the townsmen.

Winter quarters signify a place where a number of forces are laid up in the winter season, without keeping the regular guard. The soldiers, therefore, like better to be in winter quarters than in garrison.

GARRISON *Carriages* are those on which all sorts of garrison pieces are mounted. See CARRIAGE.

GARRISON *Guns*. See CANNON.

GARRISON *Town*, denotes generally a strong place in which troops are quartered, and do duty, for its security; keeping strong guards at each post, and a main guard in, or near the market-place.

GARROWS, in *Geography*, a country of Asia, situated between Bengal and Assam.

GARRULUS, in *Ornithology*, a species of AMPELIS, which see. This bird is also denominated *garrulus Bohemicus*, the Bohemian magpie, or chatterer. It has a sharp-pointed crest on the head reclining backwards, and horny appendages from the tips of seven of the secondary feathers, of the colour and gloss of the best red-wax; the bill, throat, legs, and tail, are black. The native country of these birds is Bohemia, from whence they wander over Europe, feeding on grapes where vineyards are cultivated; and they are esteemed delicious food. Pennant says they appear but by accident in South Britain; about Edinburgh in February, which they visit annually, feeding on the berries of the mountain-ash, and as far south as Northumberland, making the berries of the white thorn their food.

GARRULUS is a name given by Brisson to several species of the *Corvus*, which see.

GARRULUS *Argentoratensis*, a name given by Ray to the CORACIAS *Garrula*, which see.

GARRY, in *Geography*, a river of Scotland, which runs into the Tay, six miles N. of Dunkeld.

GARSCHAW, a town of Prussian Pomerelia; 16 miles S. of Dantzic.

GARSDEN, a town of Samogitia; 30 miles W. of Miedniki.

GARSTADT, a town of the principality of Wurzburg; three miles S.S.W. of Schweinfurt.

GARSTANG, a market, corporate town, and parish in the hundred of Amounderness, and county of Lancaster, England, contains only 62 houses and 731 inhabitants. It is seated on the western bank of the river Wyre, and on the great road between Lancaster and Preston, about eleven miles distant from each of those places. This town was incorporated by king Charles II., and is governed by a bailiff and seven capital burgesses, who are invested with authority to try all misdemeanors committed within their liberty. It has a weekly market on Thursday, with three annual fairs; and the Lancaster canal, which now passes by it, will be of essential advantage in a commercial view, and tend to surmount those obstacles which have operated against the establishment of any considerable manufactory in the town. The parish church, which is about a mile to the south, at a place called Garstang-church-town, having been weakened and undermined by an inundation of the river Wyre, was taken down and rebuilt in the year 1746, at the expence of 1910*l.* It was formerly impropriated to the abbey of Cockersand, and has chapels at Market-Garstang and Pilling.

A large printing cotton and calico manufactory has been long established at Catteral, about two miles south of the town; and at Seorton, three miles; Dolphinholm, five miles; and Catstraw, seven miles, all to the north-east, are various spinning manufactories; and another about three miles to the south-east.

Within a mile north-east of Garstang are the ruins of Greenhaugh castle, of which only one tower remains, and that in a very shattered state; but it seems to have consisted originally of seven or eight towers of great height and strength. Some writers have dated its foundation in the times of the Saxon heptarchy; but others attribute it to Thomas Stanley, the first earl of Derby, in the reign of Henry VII., as a place of protection from the nobles, whose estates he had obtained on their being proscribed as traitors.

In the vicinity of the town are Kirkland-hall, the seat of Alexander Butler, esq.; Myerscough-house, an ancient mansion, the seat of Charles Gibson, esq.; and Claughton-hall, the seat of William Fitzherbert Brockholes, esq. who has greatly improved a large morass on his estate by means of draining, &c. The Brockholes' family appear to have resided here from the time of Henry VII.

About three miles W. of Garstang, is the east-side of Pilling-Moss, the scene of a phenomenon, of which an account, to the following effect, was given in the Philosophical Transactions, No. 475. "On Saturday, the 26th of January, 1744-5, a part of Pilling-Moss, lying between Hescomb-houses and Wild Bear, was observed to rise to a surprising height,

height. After a short time it shrunk as much below the level, and moved slowly towards the south side; and in half an hour it covered twenty acres of land. The improved land adjoining to that part of the moss, which moves in a concave circle, containing near 100 acres, is nearly filled up with moss and water, and in some parts is thought to be five yards deep. One family is driven out of their house, which is quite surrounded, and the fabric is tumbling down. The part of the moss, which is sunk like the bed of a river, runs north and south, and is above a mile in length, and half a mile in breadth. When the moss began to move, a man was passing over it from the west, who perceived, to his great astonishment, that the ground moved southward. By a speedy return, he had the good fortune to escape being swallowed up."

GARTACH, a town of Wurtemberg, on a small river which runs into the Necker; 5 miles N.W. of Heilbrunn.

GARTAU, or GARTO, a town of Germany, in the principality of Luneburg-Zell; 48 miles E.S.E. of Luneburg.

GARTEMPE, a river of France, which runs into the Creuse, near Roche-Posay, in the department of the Indre and Loire.

GARTER, περισκελις, a ligature to keep up the stockings; it is also particularly used for the badge or cognizance of a noble order of knights, hence denominated the

GARTER, *Order of the*, a military order, next in dignity after the nobility, instituted by king Edward III. in 1344, under the title of the "sovereign and knights-companions of the most noble order of the Garter."

This order consists of twenty-six knights, or companions, generally peers or princes; whereof the king of England is the sovereign, or chief.

The habits and ensigns of this order, most of which have been occasionally varied, with regard to their form, materials, or colour &c. consist of the garter, mantle, surcoat, hood, George, and collar.

The *garter* gives denomination to the order, and is deemed so honourable, that the bare investiture with it makes the person, who receives that honour, a companion of the most noble military order ever known. The garter used in the ceremony of election, and which each knight wears on the left leg a little below the knee, is of blue velvet, edged with gold; with this motto; "honi soit qui mal y pense," *q. d. shame to him that thinks evil hereof*, which is wrought on the garter in solid gold; and they bear this motto surrounding their arms. The buckle and pendant are richly chased and engraved. The meaning of the motto is said to be, that king Edward, having laid claim to the kingdom of France, retorted shame and defiance upon him that should dare to think amiss of the just enterprise he had undertaken for recovering his lawful right to that crown; and that the bravery of those knights whom he had elected into this order was such as would enable him to maintain the quarrel against those who thought ill of it.

They are a college or corporation, having a great and little seal; their officers are a prelate, chancellor, register, garter king at arms, and the usher, or black rod.

Besides which, they have a dean and twelve canons, with petty canons, vergers, and twenty-six pensioners, or poor knights.

The prelate is the head; and the office is vested in the bishop of Winchester; next to him is the chancellor, which office is vested in the bishop of Salisbury, who keeps the seals. The office of register is annexed to the deanery of Windsor. All these officers, except the prelate, have fees and pensions.

The order is under the patronage and protection of St. George of Cappadocia, the tutelar saint of this kingdom. Their college is held at the castle of Windsor, within the chapel of St. George, and the chapter-house, erected by the founder for that purpose. Their robes, &c. are the garter, decked with gold and gems, and a buckle of gold, to be worn daily; and at feasts and solemnities, a mantle, surcoat, high velvet cap, collar of SS's, composed of roses enamelled, &c.

The mantle is the chief of those vestments made use of on solemn occasions. It is of blue velvet lined with white taffeta; and to its collar is fastened a pair of long strings, with large tassels, called "cordons," made of blue silk intermixed with gold. On the left breast of this mantle are placed the arms of the order within the garter, richly embroidered. The mantle worn by the sovereign is distinguished by having a longer train than that of the knights. The mantle, worn by the founder at the first feast of the order, was of fine woollen cloth, as the mantles then made for the knights undoubtedly were: mantles made of velvet first occur about the beginning of the reign of king Henry VI. The colour of these mantles is, by the founder's statute, appointed to be blue; and it so continued till the reign of queen Elizabeth, when it was changed to purple, and this was retained till about the 12th year of king Charles I., when he restored the colour of the mantle to its original institution. In the reign of king Henry VI., it seems to have been the mode to ornament the mantle with three or four welts drawn down the sides and round the bottom.

The *surcoat*, or *kirtle*, as well as the mantle, was originally composed of woollen cloth, and so continued, at least till the reign of Edward IV., about which time it was made of velvet. Anciently, the colour of this vesture changed every year, commonly into blue, scarlet, sanguine in grain, or white; it is now made of crimson velvet, lined with white taffeta.

The *hood* was formerly worn on the head at all public ceremonies, and made of the same materials as the mantle, and sometimes was trimmed or set off with a small proportion of garters; but it is not now used in the same manner as formerly, but remains fixed to the mantle as part of the habit; and, instead of the hood, the sovereign and knights now wear on their heads a cap of black velvet, deep in the crown, lined with taffeta, and adorned with a large plume of ostrich feathers, in the centre of which is a tuft or aigrette of heron's feathers; these feathers are usually fixed to the cap by a band of diamonds. The custom of wearing these caps and feathers, at the great solemnities of the order, had sometimes been omitted, in and before the reign of James I., and therefore, in a chapter held on the 13th of April, in his 10th year, the custom of wearing the cap and feathers was established.

The *collar* of the order is of gold, weighing 30 ounces Troy; it is composed of 26 pieces, in the form of the garter enamelled blue, with the motto of the order in gold; in the centre of each garter is a rose, enamelled red, seeded gold, and leaved green: these 26 garters are fastened together with as many knots of gold. At the middle of it, pendent to one of the garters, is the *badge* of the order, being the figure of St. George armed, sitting on horseback, and with a spear, encountering a dragon, which lies on his back under the horse's feet.

The sovereign and each knight wear in common the above badge, a figure of St. George within the garter, all of gold, (called the Lesser George) appendant to a broad deep blue ribbon, which ties on their left shoulder, and passes thence down

down to their right hip. They are not to appear abroad without the garter, on penalty of 6*s.* 8*d.* paid to the regifter. On the left breaft of their coats, cloaks, riding habit, or upper garment, they alfo wear a ftar of eight points, embroidered with filver, having in the centre of it the arms of the order, *viz.* argent, a crofs gules, within a garter.

The manner of electing a knight-companion into this moft noble order, and the ceremonies of inveftiture, are as follow. When the fovereign defigns to elect a companion of the garter, the chancellor of the order draws up the letters, which, paffing both under the fovereign's fign manual, and fignet of the order, are fent to the perfon by Garter principal king at arms; and are to this effect: "We, with the companions of our moft noble order of the garter, affembled in chapter, holden this prefent day at our caftle at Windfor, confidering the virtuous fidelity you have fhewn, and the honourable exploits you have done in our fervice, by vindicating and maintaining our rights, &c. have elected and chofen you one of the companions of our order. Therefore, we require you to make your fpeedy repair unto us, to receive the enfigns thereof, and be ready for your inftallation upon the day of this prefent month, &c." The garter, which is of blue velvet, bordered with fine gold wire, having commonly the letters of the motto of the fame, is, at the time of election, buckled on the left leg by two of the fenior companions, who receive it from the fovereign, to whom it was prefented on a velvet cufhion by Garter king at arms, with the ufual reverence, whilft the chancellor reads the following admonition enjoined by the ftatutes: "To the honour of God omnipotent, and in memorial of the bleffed martyr St. George, tie about thy leg, for thy renown, this noble garter; wear it as the fymbol of the moft illuftrious order, never to be forgotten or laid afide; that thereby thou mayeft be admonifhed to be courageous, and having undertaken a juft war in which thou fhalt be engaged, thou mayeft ftand firm, valiantly fight, and fucceffively conquer." The princely garter being thus buckled on, and the words of its fignification pronounced, the knight elect is brought before the fovereign, who puts about his neck, kneeling, a fky-coloured ribbon, to which is appendant, wrought in gold within the garter, the image of St. George on horfeback, with his fword drawn, encountering with the dragon. In the mean time the chancellor reads the following admonition: "Wear this ribbon about thy neck, adorned with the image of the bleffed martyr and foldier of Chrift St. George, by whofe imitation provoked, thou mayeft fo overpafs both profperous and adverfe adventures, that having ftoutly vanquifhed thine enemies both of body and foul, thou mayeft not only receive the praife of this tranfient combat, but be crowned with the palm of eternal glory." Then the knight elected kiffes his fovereign's hand, thanks his majefty for the great honour done him, rifes up and falutes all the companions feverally, who return their congratulations.

The order of the Garter appears to be the moft ancient and noble lay-order in the world. It is prior to the French order of St. Michael, by 50 years; to that of the golden Fleece, by 80 years; to that of St. Andrew, by 190 years; and to that of the Elephant, by 209 years.

Since its inftitution, there have been eight emperors and twenty-feven or twenty-eight foreign kings, befide numerous fovereign princes, enrolled as companions thereof.

Its origin is fomewhat differently related: the common account is, that it was erected in honour of a garter of Joan, countefs of Salifbury, which fhe dropped in dancing, and which king Edward picked up, whereupon fome of his nobles fmiling, as at an amorous action, he turned it off with a reply in French, "Honi foit qui mal y penfe;" adding, that fhortly after they fhould fee that garter advanced to fo high an honour, that they would account themfelves happy to wear it; but our beft antiquaries fet this afide as fabulous.

Camden, Fern, &c. take it to have been inftituted on occafion of the victory obtained over the French at the battle of Creffy: that prince, fay fome hiftorians, ordered his garter to be difplayed as a fignal of battle; in commemoration of which, he made a garter the principal ornament of the order erected in memory of this fignal victory, and a fymbol of the indiffoluble union of the knights.

Fa. Papebroche, in his analecta on St. George, in the third tome of the "Acta Sanctorum," publifhed by the Bollandifts, has a differtation on the Order of the Garter. This order, he obferves, is no lefs known under the name of St. George than under that of Garter, and that, though it was only inftituted by king Edward III. yet it had been projected before him by king Richard I. in his expedition to the Holy-Land, if we may credit an author who wrote under Henry VIII. Papebroche adds, however, that he does not fee on what that author grounds his opinion; and that, though the generality of writers fix the epocha of this inftitution to the year 1350, he rather chufes, with Froiffard, to refer it to the year 1344, which agrees better with the hiftory of that prince, where we read, that he called an extraordinary affembly of knights that year.

It appears from Raftel's Chronicle, lib. vi. quoted by Granger in the Supplement to his Biographical Hiftory, that this order was devifed by Richard I. at the fiege of the city of Acre, when he caufed twenty-fix knights, who firmly ftood by him, to wear thongs of blue leather about their legs, and that it was perfected in the nineteenth year of Edward III. If Edward III. eftablifhed this order, he might be induced to do it partly with a view to a reward appropriate to military actions, and partly from a ceremonious refpect for the ladies.

In 1551, Edward VI. made fome alterations in the ritual of this order: that prince compofed it in Latin, the original whereof is ftill extant in his own hand-writing. He there ordained, that the order fhould no longer be called the order of St. George, but that of the Garter: and, inftead of the George, hung at the collar, he fubftituted a cavalier, bearing a book on the point of his fword, with the word *protectio* graven on the fword, and *verbum Dei* on the book; with a buckle in the left-hand and the word *fides* thereon. Larrey.

For a farther account of the order of the Garter, fee Camden, Afhmole, Dawfon, Leland, Polydore Virgil, Heylin, Legar, Glover, and Fauyn.

Erhard, Cellius, and the prince of Orange, adds Papebroche, have given defcriptions of the ceremonies ufed at the inftalment of knights. A Ciftercian monk, named Mendocius Belvaletus, has a treatife, intitled La Garretiere, or Speculum Anglicanum, fince printed under the title of the Catechifm of the Order of the Garter; wherein he explains all the allegories, real or pretended, of thofe ceremonies, with the moral fignifications thereof.

Garter *principal king at arms.* This office was inftituted by Henry V.; fir William Bruges, who, in the year 1417, was Guyenne king of arms, being the perfon who firft enjoyed the office of garter. Mr. Anftis has clearly proved, that Bruges muft have been fo advanced on the feftival of St. George, which was held after the 22d of May, and before the 3d of September in the year 1417.

Garter, and *principal king at arms*, are two diftinct offices united in one perfon: Garter's employment is to attend the fervice of the order of the garter; for which he is allowed a mantle

mantle and a badge, a houfe in Windfor caftle, and penfions both from the fovereign and knights, and, laftly, fees. He alfo carries the rod and fceptre at every feaft of St. George, when the fovereign is prefent, and notifies the election of fuch as are newly chofen; attends the folemnity of their inftallations, and takes care of placing their arms over their feats; and carries the garter to foreign kings and princes, for which fervice it has been ufual to join him in commiffion with fome peer, or other perfon of diftinction.

Garter's oath relates only to fervices being performed within the order, and is taken in chapter before the fovereign and knights. His oath, as king at arms, is taken before the earl marfhal. The fucceffive garter kings of arms have been conftituted, for fome ages paft, by their refpective patents "in principalem regem Armorum Anglicorum, et præcipuum officiarium armorum inclyti ordinis Garteri;" with the name, ftile, and title of Garter. We have the following account of the office by Stephen Martin Leake, efq. who himfelf filled the faid office; "Garter was inftituted by king Henry A.D. 1417, for the fervice of the moft noble order of the Garter, and was made fovereign, within the office of arms, over all other officers, fubject to the crown of England, by the name of "Garter King of Arms of England." In his patent he is ftiled principal king of Englifh arms, and principal officer of arms of the moft noble order of the Garter, and has power to execute the faid office by himfelf, or deputy, being an Herald. By the conftitution of his office, he muft be a native of England, and a gentleman bearing arms. To him belongs the correction of arms, and all enfigns of honour, ufurped or borne unjuftly; and alfo to grant arms to deferving perfons, and fupporters to the nobility and knights of the Bath; to go next before the fword in folemn proceedings, none interpofing except the Conftable and Marfhal; to adminifter the oath to all the officers of arms; to have a habit like that of the Regifter of the order; Baron's fervice in the court; lodgings in Windfor caftle; to bear his white rod, with a banner of the enfigns of the order thereon, before the fovereign; alfo, when any lord fhall enter the parliament chamber, to affign him his place, according to his dignity and degree; to carry the enfigns of the order to foreign princes; and to do, or procure to be done, what the fovereign fhall enjoin, relating to the order; with other duties incident to his office of Principal King of Arms; for the execution whereof he hath a falary of 100*l.* a year, payable at the Exchequer, and 100*l.* more out of the revenue of the order, befides fees."

Garter is alfo a term in *Heraldry*, fignifying the moiety, or half of a bend.

GARTH, *Sir* Samuel, in *Biography*, an excellent poet and phyfician, was born of a good family in Yorkfhire, and educated at Peter-houfe college in Cambridge, where he took the degree of doctor of phyfic on the 7th of July 1691. His tafte for polite literature induced him to continue his refidence in college until the period of his graduation; foon after which he fettled in London with a view to practife his profeffion, and was admitted a fellow of the College of Phyficians on the 26th of June, 1692. At this time the college was embroiled in a difpute, in confequence of a charitable inftitution which they had refolved to eftablifh, for the purpofe of giving gratuitous advice to the poor, and of furnifhing them with medicines at prime coft. But this project was oppofed by the apothecaries, who found means to raife a party in the college itfelf againft it. Dr. Garth, difapproving the behaviour of the apothecaries, as well as fome members of the faculty, in this affair, refolved to expofe them in a fatire; which he accordingly executed, with peculiar fpirit and vivacity, in his admirable poem entitled "The Difpenfary." The firft edition of this poem was publifhed in 1694, and it went through three impreffions in a few months, in confequence of which fuccefs he afterwards made many additions and corrections; and in 1706 he publifhed a fixth edition, with feveral defcriptions and epifodes not before printed. In 1697 he fpoke the annual fpeech in Latin, called the Harveian oration, before the college, which was foon after publifhed, and led to a difcuffion, whether he was moft entitled to admiration as a poet or as an orator. In this oration he ridiculed the multifarious claffes of the quacks with a juft fpirit and inimitable humour.

So much literary merit gained him a high reputation as a polite fcholar, and introduced him to the fociety and friendfhip of the moft diftinguifhed characters. He was one of the firft members of the famous Kit-kat club, which confifted of above thirty noblemen and gentlemen of diftinguifhed talents, and was inftituted in 1703; with the defign of fupporting a warm zeal for the proteftant fucceffion in the houfe of Hanover. On the acceffion of king George I. to the throne, Dr. Garth had the honour of being knighted with the duke of Marlborough's fword, and was appointed the king's phyfician in ordinary, and phyfician general to the army. He is faid to have had a very extenfive practice, which has rarely fallen to the lot of phyficians who have commenced their career by the cultivation of poetry. In his practice he conducted himfelf with great moderation as to his views of pecuniary reward, and with a ftrict regard to the honour and intereft of the faculty, never ftooping to proftitute the dignity of his profeffion, through mean and fordid views of felf intereft, to any, even the moft popular and wealthy apothecaries. In a fteady adherence to this principle, he concurred with the celebrated Dr. Radcliffe, with whom he was often joined in medical confultation.

The difeafe which feized him, and terminated with his life, in January, 1719, occafioned a general concern, and was particularly lamented by lord Lanfdown, a brother poet, though of a different party, in fome excellent verfes, as well as by Mr. Pope, in one of his letters. He was buried in the church of Harrow-on-the-Hill, on the 22d of January. See Biograph. Dict. Eloy. Dict. Hift.

Garth is ufed in fome parts of England for a little backfide or clofe. It is an ancient Britifh word. *Gardd*, in that language, fignifies garden, and is pronounced and written garth.

Garth, a term fometimes employed to denote a fmall garden, yard, or croft. It is alfo applied to a dam, or wear.

Garth-*men* is ufed in our ftatutes for thofe who catch fifh by means of fifh-garths or wears.

By ftatute it is ordained, that no fifher nor garthman fhall ufe any nets or engines to deftroy the fry of fifh, &c. 17 Ric. II. cap. 9. The word is fuppofed by fome to be derived from the Scotch word *gart*, which fignifies *forced* or *compelled*; becaufe fifh are forced by the wear to pafs in a loop, where they are taken.

GARTZ, or Garz, in *Geography*, a town of Pomerania, in the ifland of Rugen, built on the feite of an ancient city, called "Carenz," which was deftroyed by the duke of Pomerania, in the 12th century.—Alfo, a town of Anterior Pomerania, on the Oder, furrounded with walls in 1258; 15 miles S. of Old Stettin. N. lat. 53° 16'. E. long. 14° 28'.

GARU, a town of Sweden, in the province of Upland; 20 miles N.N.E. of Stockholm.

GARVAGH, a poſt town of the county of Londonderry, Ireland, near the river Agivey, over which it has two bridges. It is alſo a market and fair town, but is a very ſmall place. It is 100½ miles N. from Dublin, and eight miles S. from Coleraine.

GARVAO, a town of Portugal, in Alentejo, on the Tagus; 12 miles E. of Abrantes.—Alſo, a town of Portugal, in Alentejo, ſix miles W. of Ourique.

GARVELACH, a ſmall iſland near the weſt coaſt of Scotland, in the county of Argyle; eight miles S.E. of Mull iſland. N. lat. 56° 14'. W. long. 5° 44'.

GARVILANS, a ſmall iſland on the north coaſt of Ireland, in the county of Donegal; about two miles E.S.E. from Malin head.

GARUM, a word in very common uſe among the old writers on medicine, who expreſſed by it a pickle, in which fiſh had been preſerved. The principal kind of fiſh they preſerved in this manner was the mackarel.

The garum principally conſiſted of the juices of the fiſh and ſalt; but we find the old writers ſpeaking of ſeveral kinds of it: one they call Spaniſh garum, from the place whence they had it; another kind from its colour was termed the black garum: this laſt kind ſeems to have been that called *fæcoſum* by the Latin poets, as if the fæces and remains of the fiſh were left among it; and by others *garum ſanguineum*, from its being ſometimes tinged with their blood to a reddiſh colour. The Romans ſometimes called the Spaniſh kind, which was eſteemed the beſt, *garum ſociorum*; and Galen ſays that the black garum was called *oxyporum*, but he only means by this, that it was uſed in the preparations called oxypora. It ſerved to dilute them, and thence took the name of them to itſelf, by way of diſtinction from the Spaniſh, and other kinds, not uſed to this purpoſe. Pliny tells us, that garum was compoſed of all the offals of fiſh, of every kind, macerated in ſalt; it had its name, he ſays, from its being originally made of a fiſh, called by the Greeks *garos*, but in his time the beſt ſeems to have been made with the mackarel; but that there were ſeveral other kinds uſed both in food and medicine, ſome of which muſt have been made from ſcarce fiſh, for they were of great price. They were uſed in glyſters, and externally applied in ſeveral kinds of cutaneous eruptions: the ancients had a great opinion of them in glyſters, for removing the pain in the ſciatica, and other like caſes; and the coarſer ſorts were their common medicine for curing cattle of the ſcab, by making inciſions in the ſkin, and laying over the part cloths wetted with them. See Strabo, lib. iii. 109. Plin. lib. xxxi. cap. 8.

The true way in which the ancients prepared their garum, which they ſo much valued as a delicacy at their tables, is unknown to us; but it appears that ſome kinds of garum had no fiſhy matter in them, from Aetius, who gives the following preſcription of a liquor, which he calls by this name: take of common water thirty-one pints, of ſea-ſalt two pints, and of dried figs fifty; let theſe all macerate together, and afterwards be ſtrained clear for uſe. All the garums were eſteemed hot and drying by the ancients, and were ſometimes given as laxatives before food. The modern writers underſtand the word garum in a much more limited ſenſe, meaning no more by it than the brine or pickle in which herrings or anchovies are preſerved.

GARUMNA, in *Ancient Geography*, a river of Gaul, which, as Cæſar informs us, divided the Gauls from the Aquitans; now the *Garonne*, which ſee.

GARWOLIN, in *Geography*, a town of Poland, in the palatinate of Maſovia; 12 miles E. of Czerſk.

GARY, a town of Hindooſtan, in Guzerat; 57 miles E. of Janagur.

GARYENUM, in *Ancient Geography*, a river of Britain, mentioned by Ptolemy, and ſuppoſed to be the river Yare, the mouth of which is at Yarmouth.

GARZETTA, EGRET, in *Ornithology*, a ſpecies of *Ardea*, with a creſted head, white body, black bill, and the ſpace about the eyes and the legs greeniſh. The feathers of the creſt are very ſoft and white, and are much valued. It is eaten in Venice and Italy, and common in the markets there. It is the Ardea alba minor, or the ſmall white heron; and it is alſo called *Gaza giovane*. See HERON.

GARZIL, a term ſometimes applied provincially to hedging-wood.

GARZIS, in *Geography*, a town of Africa, in the kingdom of Fez, ſurrounded with walls, and with houſes built of black ſtone, ſituated in a fertile country on the Mulu; 56 miles S. of Melilla.

GARZO, a river of Italy, which paſſes by Breſcia, and joins the Mela, near Manerbio.

GARZONI, TOMASO, in *Biography*, born in 1549 at Bagnacavallo, near Ferrara; he was a regular canon lateran, died in his own country 1589, at 40 years of age. He was author of ſeveral moral works, printed at Venice, 1617, in 4to. But the principal production of this active writer and general reader is entitled "La Piazza univerſale di tutti le profeſſioni del mondo," a work of infinite labour and conſiderable uſe at the time it was written, as the author had almoſt all the materials to ſeek, there being no direct model on ſo extenſive a ſcale then extant. Among innumerable ſubjects included in his plan, his 42d Chap. is appropriated to muſic and muſicians, as well vocal as inſtrumental, to the time when his work was publiſhed. This *diſcorſo* may well be called an epitome of the hiſtory of muſic, ancient and modern, with a liſt of its moſt renowned profeſſors. Whatever muſical hiſtorian had been ſo fortunate as to ſee this work when collecting and ſelecting materials, he would have been ſaved infinite trouble in his reſearches, by finding where muſic had been treated incidentally as well as *ex profeſſo*. This author had chiefly educated himſelf, and learned, without a maſter, Hebrew and Spaniſh. His "Piazza Univerſale" ſeems firſt to have been publiſhed at Venice, the year in which he died, and afterwards went through innumerable editions. Superficial knowledge only is to be found in his book; but it points out where more and better information may be found. It has been truly ſaid by Father Niceron, that the works of Garzoni prove him to have dipt into all the ſciences, and ſufficiently manifeſt the extent of his knowledge, and of what he would have been capable with a regular education and a longer life. His reflections, when he allows himſelf time to make them, and room in his book for their inſertion, are excellent. But the taſk he had ſet himſelf was too great for a ſingle mind, or the bodily labour of an individual.

It is extremely difficult to render the title of this book in Engliſh; the word Piazza has twelve or fourteen different meanings and ſhades of meaning in the Cruſca: it implies a ſquare or market-place appropriated to commerce. Perhaps "the univerſal commerce of all the arts and profeſſions in the world" may nearly expreſs the author's meaning.

It is ſingular that this work is unnoticed in the Bibl. Ital. of Fontanine.

GAS, a generic name given by Van Helmont to elaſtic fluids, and now generally adopted. The term *air* was made

generic by Prieftley; but this feems rather to imply that elaftic fluids are only modifications of common or atmofpheric air, the contrary to which is now known to be true. The term gas is therefore properly preferred.

Though the obfervations of Van Helmont, Boyle, Hales, Black, and Cavendifh, feemed to leave no doubt that there exifted three or four kinds of air or fluids agreeing in the property of elafticity, yet no very diftinct notion was formed on the fubject, till the difcoveries of Prieftley and thofe of Lavoifier illuminated the fphere of chemical fcience. Since then moft chemical enquiries have been connected with the knowledge of gafeous bodies, and great addition has been made to the number of gafes and to the knowledge of their diftinctive properties. Elaftic fluids have in fact been divided into two genera, *gafes* and *vapours*; the former fignify fuch elaftic fluids as retain their elafticity in all known temperatures; the latter fignify thofe elaftic fluids which lofe their elafticity by cold, and become liquids, &c. This diftinction may have its ufe; but there is great reafon to believe the difference is not in kind but in degree only; and that all the gafes would lofe their elafticity provided the temperature could be fufficiently reduced.

The mechanical properties of the gafes, or thofe relating to their elafticity and gravitating energy being, as far as is known, the fame as thofe of the atmofphere, will be ftated under the head of PNEUMATICS The other general properties, which fall rather under a chemical than mechanical head, will be pointed out and explained in what follows; and a more detailed account of each gas will be found under its fpecific name.

Gafes may be confidered as *fimple* or *compound*. The fimple gafes, according to our prefent knowledge, are three; namely,

1. Hydrogen.
2. Oxygen.
3. Azote or nitrogen.

The compound gafes and vapours which have been clearly difcriminated from each other are,

4. Nitrous gas, from azote and oxygen.
5. Nitrous oxyd, from azote and oxygen.
6. Carbonic oxyd, from carbon and oxygen.
7. Carbonic acid, from carbon and oxygen.
8. Carburetted hydrogen, from carbon and hydrogen.
9. Olefiant gas, from carbon and hydrogen.
10. Sulphuretted hydrogen, from fulphur and hydrogen.
11. Sulphurous acid, from fulphur and oxygen.
12. Fluoric acid, from hydrogen and oxygen?
13. Muriatic acid, from hydrogen and oxygen?
14. Oxymuriatic acid, from muriatic acid and oxygen.
15. Ammoniacal gas, from azote and hydrogen.
16. Phofphuretted hydrogen, from phofphorus and hydrogen.
17. Arfeniuretted hydrogen, from arfenic and hydrogen.
18. Nitric acid, from azote and oxygen.
19. Nitrous acid, from azote and oxygen.
20. Aqueous vapour or fteam, from oxygen and hydrogen.
21. Alkoholic vapour, from carbon and hydrogen.
22. Ethereal vapour, from carbon and hydrogen.

It is particularly remarkable that in all the above lift of compound gafes no one has been proved to contain more than two elements. Though Berthollet and fome others conceive certain gafes to contain *three* elements; namely, carbon, hydrogen, and oxygen, and hence denominate them *oxy-carburetted* hydrogen; yet they have given no decifive proof of the exiftence of fuch gafes. Indeed it is almoft obvious that all the gafes which have been adduced of this triple character are nothing but mere mixtures of hydrogen, carbonic oxyd, and carburetted hydrogen from ftagnant water. We may well hefitate to admit fuch diftinction till fome one can point out a method of obtaining a gas uniformly the fame, and which cannot be procured by mixing the above three or any others in any proportion. The conftitution of the fluoric and muriatic-acid gafes is not yet fully known; but there is great reafon to fufpect, from the recent difcoveries of Davy, that oxygen and hydrogen are the chief, if not the only elements. Poffibly it may be found that *three* elements cannot unitedly conftitute an elaftic fluid.

We fhall now confider, 1ft. The nature of fimple gafes; 2d. The nature of compound gafes; 3d. The nature of gafeous mixtures; and, 4th. We fhall exhibit tables fhewing the more remarkable properties of the gafes in one point of view, with obfervations, &c.

1. *The Nature of fimple Gafes.*—The conftitution of an elaftic fluid was firft pointed out and demonftrated by Newton in the 23d prop. of the fecond book of the Principia; namely, that it confifts of particles which repel one another by a force which varies in the fimple inverfe ratio of the central diftances. At leaft a fluid fo conftituted would exhibit the fame mechanical properties as atmofpheric air. On the nature of this repulfive power there have been feveral fpeculations; fome have imagined it to be magnetical; others electrical; and others, with more feeming probability, have afcribed it to heat. Indeed, when it is confidered that the elafticity increafes and diminifhes with the temperature to the moft diftant points we can attain, heat muft be a principal if not the fole caufe of aerial repulfion. On this idea a particle of an elaftic fluid may be fuppofed an indefinitely fmall, hard, and indivifible body, furrounded by an infinitely fine and fubtile fluid, heat, forming a kind of atmofphere around it of comparatively great extent, but variable according to preffure, &c. This atmofphere will be of greateft denfity at the furface of the particle, and of lefs denfity in fome proportion to the diftance.

Mr. Dalton has developed and extended this notion, of heat being the caufe of repulfion, in his New Syftem of Chemical Philofophy. He deduces a very curious conclufion, and very important one, if it be true, that all elaftic fluids contain the fame quantity of heat attached to their ultimate particles, whether fimple or compound, in like circumftances; and that a greater or lefs attraction of the particles for heat will have no influence in this refpect, but only to condenfe a greater number of them into the fame fpace. If this conclufion be correct, the capacities of elaftic fluids for heat will be proportional to the number of their particles in a given volume. Affuming *data*, the accuracy of which he promifes to demonftrate, namely, the relative weights of the ultimate particles of certain gafes, as in the following table, he derives the fpecific heats agreeable to the above hypothefis, as follows.

	Relative Weights of ultimate Particles.	Specific Heat of equal Weights.
Hydrogen	1	9.382
Azote	5	1.866
Oxygen	7	1.333
Atmofpheric air	0	1.759
Nitrous gas	12	·777
Nitrous oxyd	17	·549
Carbonic acid	19	·491
Ammoniacal gas	6	1.555
Carburetted hydrogen	7	1.333

Olefiant

	Relative Weights of ultimate Particles.	Specific Heat of equal Weights
Olefiant gas	6	1·555
Nitric acid	19	·491
Carbonic oxyd	12	·777
Sulphuretted hydrogen	16	·583
Muriatic acid	22	·424
Aqueous vapour	8	1.166
Ethereal vapour	11	·848
Alkoholic vapour	16	·586
Water	0	1.000

2. *The Nature of compound Gases.*—By a compound gas we mean an elastic fluid which arises from the chemical union of the elements of two or more elastic fluids, or of one elastic fluid and another inelastic body; thus, a certain quantity of carbonic oxyd gas and oxygen gas may be combined so as to make carbonic acid gas, which is different from either of the ingredients in volume, and in other essential properties. Also, from oxygenous gas and sulphur may be formed sulphurous acid gas. These compound gases are chiefly modern discoveries, and their nature has never yet been very satisfactorily explained. They are observed to agree with the simple gases in their mechanical relations. From this fact it would seem that by applying the Newtonian doctrine they must be constituted of particles repulsive of each other, like the simple gases. These particles must be compounded, and in all probability of the elementary particles of the simple gases; that is, a particle of a simple gas, A, must be united to one, or more, particles of another body B; and the new compound may be surrounded with an atmosphere of heat, and form a particle of a compound gas C. In this way, if we may suppose all ultimate particles of the same kind to be exactly alike, compounds of various, but simple relations in quantity, such as those of 1, 2, 3, may be formed; and many of the phenomena indicate such relations. For instance, the above-mentioned carbonic acid gas contains, according to the best experiments, just *twice* as much oxygen as the carbonic oxyd contains from which it is produced, indicating that if a particle of the latter gas contains *one* of oxygen, a particle of the former must contain *two* particles of oxygen.

3. *The Nature of gaseous Mixtures.*—Dr. Priestley, in the course of his interesting enquiries in pneumatic chemistry, could scarcely fail to notice a remarkable fact which subsequently has occasioned much discussion; namely, that gases of different specific gravities intermix in opposition to their gravitating tendencies, and when once completely diffused through each other, remain so notwithstanding their rest. Yet it does not appear that any chemical affinity is exercised; or, if it were, would it account for the phenomena. He has given us a section on this very subject, wherein he establishes the fact by experiments; but he does not satisfy himself by any explanation. The fact has since been corroborated by a series of experiments directed towards this point by Dalton, in the Manchester Memoirs, vol. i. new series, and by Berthollet, in the second volume of the Memoires d'Arcueil. The latter of these philosophers, however, finds a considerable difference in the *times* which the different gases take to become uniformly diffused through each other. Thus, hydrogen is diffused more quickly, and carbonic acid more slowly than the rest. The atmosphere is an example of two gases of different specific gravities, which permanently continue to be diffused through each other. Many modern philosophers rest satisfied with the explanation which ascribes the effect to a slight chemical affinity; but though this might perhaps be admitted, were it only required to account for gases remaining in a state of diffusion, yet it does not provide for a heavy gas, as carbonic acid, being drawn up to the top of a receiver to the distance of a foot or more from its natural situation. Mr. Dalton, some time ago, suggested an hypothesis which effectually explained the whole phenomena, but the hypothesis on other accounts was deemed too improbable. It consisted in the supposition that the particles of different gases were neither attractive nor repulsive of each other, but neutral; so that any gas was impelled by its own repulsion to fill any space in which it might be found, just as if it were the only gas present. This hypothesis the author himself has abandoned, and now, in consequence of further elucidation which time and reflection have produced, he ascribes the effects in question to the different sizes of the ultimate elastic particles of different gases. He attempts to establish the position "that every species of pure elastic fluid has its particles globular and all of a size, (meaning the solid central atom, together with its atmosphere of heat,) but that no two species agree in the size of their particles," the pressure of temperature being the same. Also that heat is the cause of repulsion. From these considerations he concludes that no one elastic fluid can rest permanently on another, unless they happen to have ultimate particles of exactly the same size, which probably does not take place in any two gases. This explanation deserves attention; time will shew how far it is satisfactory. See New System of Chemical Philosophy, page 188.

Some gases, when mixed, combine with each other; others are merely diffused through the whole space. Of some of these mixtures it may be proper to take a little notice.

1. Hydrogen mixes with azote, nitrous gas, carbonic oxyd and acid, carburetted, sulphuretted, and phosphuretted hydrogen, ammoniacal gas, &c. without undergoing any change.

2. Hydrogen mixes with oxygen and nitrous oxyd without any change; but an electric spark unites the oxygen to the hydrogen, and forms water, and in the latter case azotic gas likewise.

3. Hydrogen mixes with oxy-muriatic acid without any change in the first instance; but an electric spark converts the mixture into muriatic acid and water. This effect may also be produced by exposing the mixture of gases to the sun's rays, when after a few moments an explosion takes place.

4. Oxygen and nitrous gas instantly combine and form nitric or nitrous acid; oxygen mixes with most or all other gases without any change; but an electric spark unites it to some element, when mixed with carbonic oxyd, olefiant gas, carburetted, sulphuretted, and phosphuretted hydrogen, and ammoniacal gas.

5. Azotic gas mixes with all other gases without any change.

6. Oxymuriatic acid gas converts nitrous gas into nitric acid. When mixed with hydrogen, and exposed to light, water and muriatic acid are formed; if exposed to the direct rays of the sun, when above 30° of altitude, an explosion ensues, as has lately been discovered by Gay Lussac, and Thenard in France, and by Dalton in England. When mixed with with carburetted hydrogen, carbonic oxyd, or olefiant gas, and exposed to the sun, over water, a pretty rapid combustion ensues. Most of these mixtures too explode with an electric spark, that with carbonic oxyd excepted. This gas acts upon sulphuretted and phosphuretted hydrogen gases in mixture; and converts sulphurous acid gas into sulphuric acid.

7. Ammoniacal gas combines with the several acid gases and forms with them salts.

4. *Tables*

4. *Tables exhibiting the weights, ſpecific gravities, conſtituent principles, &c. of the principal gaſes.*

1.—TABLE

Of the weights, ſpecific gravities, and volume of the gaſes abſorbed by water

N. B. The weights, &c. are at a mean temperature and preſſure; and water is ſuppoſed 820 times the weight of common air.

Kind of Gas.	Weight of 100 cubic Inches in Grains.	Specific Gravity.	Volume of Gas abſorbed by a given Volume of Water.
Atmoſpheric air - -	31	1.00	$\frac{1}{50}$
Hydrogen - - -	2.5	0.08	$\frac{1}{64}$
Oxygen - - -	34	1.10	$\frac{1}{27}$
Azote or nitrogene -	30.2	0.97	$\frac{1}{64}$
Nitrous gas - -	32.2	1.04	$\frac{1}{27}$
Nitrous oxyd - -	50	1.60	1 nearly
Carbonic oxyd - -	29	0.94	$\frac{1}{27}$
Carbonic acid - -	47	1.52	1
Carburetted hyd. from ſtagnant water -	18.6	0.6	$\frac{1}{27}$
Olefiant gas - -	29.5	0.95	$\frac{1}{8}$
Sulphuretted hydrogen -	36	1.16	1
Sulphurous acid - -	71	2.30	20
Fluoric acid (ſilicated) -	130	4.20	400
Muriatic acid - -	39.5	1.24	400
Oxymuriatic acid -	76	2.46	2
Ammoniacal gas - -	18.6	0.60	400
Phoſphuretted hydrogen -	26	0.84	$\frac{1}{27}$
Nitric acid - -	76	2.4	—
Aqueous vapour - -	21	0.7	—
Alkoholic vapour -	65	2.1	—
Ethereal vapour - -	70	2.25	—

The weights and ſpecific gravities in the above table are taken from the moſt reſpectable authorities. Indeed the reſults have been obtained ſo nearly the ſame by different authors, that there can be no doubt of their being good approximations to truth. A ſtill greater degree of accuracy is however both deſirable and attainable. Some of the above tabular numbers muſt be conſidered as more doubtful than others; becauſe few experiments have been made, and thoſe liable to objections. This obſervation applies more directly to fluoric, oxymuriatic, and nitric acid gaſes, and to phoſphuretted hydrogen, and to the vapours.

In regard to the quantity of any gas abſorbed by water when duly agitated together, it is obſervable that water takes juſt its own volume of ſome of the gaſes; in other inſtances, it takes ſome fractional part of its volume, which fraction has always for its numerator unity, and for its denominator the cube of ſome one of the ſeries 1, 2, 3, &c. thereby indicating that the diſtance of the particles of air in the water is always 1, 2, 3, &c. times their diſtance out of the water. There is an apparent exception in atmoſpheric air; but this is in reality a confirmation of the rule; for the atmoſphere is compoſed of 4 parts of azotic gas, and 1 of oxygen; and $\frac{4}{5}$ of $\frac{1}{64}$ + $\frac{1}{5}$ of $\frac{1}{27}$ = $\frac{1}{50}$ nearly. Whether the elaſticity of the gaſes in this their connection with water is impaired or deſtroyed are objects of enquiry. According to Dr. Henry's experiments, the quantity of any gas abſorbed (not exceeding unity) is in direct proportion to the preſſure of the gas of its own kind; and that preſſure being removed, the internal or abſorbed gas is conſtantly making its eſcape. It muſt therefore retain its elaſticity. The obſervation will apply even to thoſe gaſes that are ſo largely abſorbed by water; their elaſticity muſt indeed be amazingly impaired by the action of the water, but it is not deſtroyed; for the gaſes are conſtantly making their eſcape from the water, unleſs reſtrained by an incumbent atmoſphere of their own kind. It ſhould ſeem then, that the connection of theſe gaſes with water, which have not their elaſticity impaired, is purely of a mechanical nature; whilſt that of the very abſorbable gaſes is partly of a mechanical and partly of a chemical nature.

The following table exhibits the volumes of certain elaſtic fluids which combine, and the correſponding volume of the new compound, when elaſtic; alſo the proportional weights of the ſimple elements in a given weight of the compound.

2.—TABLE

Of the Proportions of the conſtituent Principles of compound Gaſes.

Compound Gaſes, &c.		Conſtituent Principles in Meaſures.		Conſtituent Principles in Weights.		
	Meaſures.	Meaſures.	Meaſures.	Weight.	Weight.	Weight.
Ammoniacal gas - -	100	= 52 azote - -	+ 133 hydrogen	83 azote -	+ 17 hydrogen	= 100
Water - - - -	—	= 100 oxyg. -	+ 200 hydrogen	87½ oxyg. -	+ 12½ hydrogen	—
Nitrous gas - - -	100	= 47 azote - -	+ 55 oxygen -	42 azote -	+ 58 oxyg. -	—
Nitrous oxyd - -	100	= 99 azote -	+ 58 oxygen -	59 azote - -	+ 41 oxyg. -	—
Nitric acid - - -	—	= 180 nitrous gas -	+ 100 oxygen -	27 azote -	+ 73 oxyg. -	—
Nitrous acid - - -	—	= 360 nitrous gas -	+ 100 oxygen -	33 azote - -	+ 67 oxyg. -	—
Oxymuriatic acid - -	100	= 150 mur. acid -	+ 50 oxygen -	76 mur. acid -	+ 24 oxyg. -	—
Sulphurous acid - - -	100	= 100 oxygen -	+ ſulphur -	52 oxyg. -	+ 48 ſulphur -	—
Sulphuric acid - -	—	= 100 ſulphurous acid	+ 50 oxygen -	79½ ſulphurous acid	+ 20½ oxygen -	—
Carbonic oxyd - -	100	= 47 oxygen -	+ charcoal - -	55 oxygen -	+ 45 charcoal -	—
Carbonic acid - -	100	= 100 oxygen -	+ charcoal -	72 oxygen - -	+ 28 charcoal -	—
Carburetted hydrogen -	100	= 200 hydrogen -	+ 1 part charcoal	27 hydrog. -	+ 73 charcoal -	—
Olefiant gas - - -	100	= 200 hydrogen -	+ 2 parts charcoal	15 hydrog. -	+ 85 charcoal -	—
Sulphuretted hydrogen -	100	= 100 hydrogen -	+ ſulphur - -	7 hydrog. -	+ 93 ſulphur -	—
Phoſphuretted hydrogen -	100	= 100 hydrogen -	+ phoſphorus -	10 hydrog. -	+ 90 phoſphorus	—
Muriate of ammonia - -	—	= 100 mur. acid -	+ 100 ammon. gas	65 mur acid -	+ 35 ammon. gas	—
Carbonate of ammonia -	—	= 100 carb. acid -	+ 80 ammon. gas	76 carb. acid -	+ 24 ammon. gas	—
Sub-carbonate of ammonia	—	= 100 carb. acid -	+ 160 ammon. gas	61 carb. acid -	+ 39 ammon. gas	—

In the 2d vol. of the Memoires d'Arcueil, Gay Luſſac has two ingenious eſſays, the one on the combination of gaſeous ſubſtances one with another, and the other on nitrous vapour and nitrous gas, in which he advances an hypotheſis that gaſeous ſubſtances always combine with each other, either in equal volumes, or in volumes which are ſmall ſimple multiples one of the other. For inſtance, he argues that 100 meaſures of oxygenous gas united with 200 meaſures of nitrous gas, conſtitute nitric acid, and with 300 meaſures of nitrous gas, nitrous acid. Now every one, who has had experience on this ſubject, knows that 100 meaſures of oxygen are convertible into an acid vapour by 180 of nitrous gas or leſs, if properly mixed. What then is this acid? It cannot, according to Gay Luſſac, be either the nitric or nitrous. Again, by proper treatment, 100 meaſures of oxygen may be made to unite with 320, 340, or 360 nitrous gas, by preſenting two thin ſtrata of the gaſes to each other over water in a wide veſſel. And as all intermediate proportions between 140 and 360 meaſures of nitrous gas may eaſily be united with the oxygen, there is not any apparent reaſon for ſelecting 200 and 300 meaſures of nitrous gas as forming the only definite compounds. Gay Luſſac has given a table analogous to the above, founded on his hypotheſis, but our proportions differ very materially from thoſe of his table, and we have no doubt as to their ſuperior accuracy in general, as they are the reſults of experience.

We ſhall conclude this article with the following table of the proportions of certain combuſtible gaſes and oxygen, which unite by the electric ſpark in Volta's eudiometer, and the products formed.

3.—Table

Of the Combination of combuſtible Gaſes with Oxygen, and the Products.

Meaſures of pure Gas.	Meaſures oxygen.		Meaſures carbonic acid.
100 Carbonic oxyd, unite to	47	products	94
100 Carburetted hydrogen	200	——	100 + water
100 Olefiant gas	285	——	190 + water
100 Sulphuretted hydrogen	150	——	100 ſulphurous acid + water
100 Phoſphuretted hydrogen	150	——	phoſphoric acid + water
100 Ammoniacal gas	67	——	52 azote + water

Gas, in *Agriculture* and *Vegetable Economy*, an aëriform fluid material, which is ſuppoſed to be taken up as the food of plants. There are ſeveral kinds that are believed to be uſeful in this way, as the ammoniacal, the carbonic acid gas, &c. See Food *of Plants*, and Vegetation.

Gas *Light, Apparatus for producing*. The light and heat procured by the combuſtion of carburetted hydrogen gas, is one of thoſe recent inventions which promiſes to be of the moſt general utility, though it may be ſaid to be at preſent in its infancy; the inflammability of the gas, produced from the diſtillation of pit coal, has long been a fact familiar to chemiſts, though it is only within theſe few years that experiments have been made, with a view to determine the beſt form of an apparatus for producing the gas, at the leaſt expence of fuel for the diſtillation, and at the ſame time to ſeparate from it the tar and ammoniacal fluid which are thrown out from the coals with it; and would, if ſuffered to remain with the gas, cauſe many inconveniences from their intolerably offenſive ſmell, but may, when ſeparated, be applied to uſeful purpoſes.

Mr. Murdoch was probably the firſt perſon who put in practice gas lights on an extenſive ſcale; he commenced his experiments on this ſubject in the year 1792, and in 1798 he applied it for the lighting part of the very extenſive manufactory of Meſſrs. Boulton, Watt, and Co. at Soho near Birmingham, and in 1802, at the time of the Peace, the illumination of the Soho works was made by gas. Since this period, the method has been adopted in many places by different individuals, who, proceeding from their own ideas, naturally introduced various forms of the apparatus, the moſt perfect of which we propoſe to deſcribe with drawings, in ſuch a manner as to enable mechanics to conſtruct them, this being the moſt probable means of their being farther improved, and their advantages more fully eſtabliſhed. The carburetted hydrogen gas is produced in the following manner: A quantity of pit coal is introduced, and cloſed up in an iron retort, diſpoſed in a proper furnace, by which it can be heated ſo as to throw out the volatile portions of the coals; theſe are conducted by a pipe into a refrigeratory, where the tar and ammoniacal fluid are depoſited: the gas then enters into a gazometer, being in its way paſſed through water to waſh and take from it any remaining tar or other impurities which may cauſe an unpleaſant ſmell. The gazometer is fitted up in the ſame manner as for other chemical experiments, riſing and falling freely in water to regulate the admiſſion of the gas, which is conveyed by pipes from it to the burners or lamps where it is conſumed. Theſe are formed in various ways, either a tube ending with a ſimple orifice, at which the gas iſſues in a ſtream; and if once lighted will continue to burn with the moſt ſteady and regular light imaginable, as long as the gas is ſupplied. At other times a number of very minute holes are made in the end of a pipe, which form as many *jets de feu*, and have a very brilliant appearance. This may ſometimes be placed in the focus of a parabolic reflector. In caſes where the light is required to be thrown to a diſtance, other burners are conſtructed upon the ſame principle as the Argand lamp, forming a cylinder of flame, and admitting a current of air both to the inſide and outſide.

Fig. 1. of *Plate* XVII. *Miſcellany*, is a ſection of an apparatus for producing the gas adopted by Mr. Samuel Clegg of Mancheſter, and communicated to the Society of Arts in 1808, when they voted Mr. C. a ſilver medal for the communication. A repreſents a caſt iron retort, in which are put the coals, to be decompoſed by the heat of a fire applied beneath it. The retort is ſituated in a chamber repreſented by the dark ſpace, in which the flame from the coals placed upon the grate B circulates all round the retort, and eſcapes by the chimney D; E is the aſh-pit beneath the grate; the double thickneſs of metal beneath the retort denotes a ſaddle or half cylinder of caſt iron, which preſerves that part of the retort which is moſt expoſed, and cauſes it to be heated more uniformly; F is the mouth where the coals are introduced, it has a flaunch and a cover ground together, air tight, and faſtened by a ſcrew in the centre, or by one at each ſide: *a* is an iron pipe conducting from the retort to a veſſel G, ſituated

G, situated beneath the gazometer; in this vessel the tar and other condensible products are separated from the gas, which ascends the pipe *b*. The upper end of this is covered in the manner of a hood by a cylindric vessel *d*, open at bottom, but partially immersed beneath the surface of the water contained in the cistern of the gazometer, and perforated round, near the lower edge, with a number of small holes. The gas displaces the water from the receiver *d*, and escapes through the small holes rising in bubbles through the water, so as to expose a large surface to its action, that it may be washed and purified from any smell. After rising through the water, the gas enters the gazometer H H, which is suspended to move up and down by the chains and pulley *e e*, and balance weights *f*, *f*. In the centre of the gazometer a tube *g* is fixed, having some small holes at its upper end, by which it communicates with the interior of the gazometer. This tube includes another, *h*, fixed perpendicular from the bottom of the cistern, and communicating with others *k*, which convey the gas to the burners. The fixed pipe *h* forms a guide to keep the gazometer always perpendicular; and the pipe in the centre of the gazometer prevents any gas passing away except it has ascended to the top of that vessel, and is transparent and fit for use. The gazometer is made of iron plate rivetted together, and sustained by a strong hoop at top and another at bottom. Each hoop has radial bars which support the tube *g* in the centre, and at the same time they strengthen the whole. The gazometer must be painted within and without to preserve it from rusting. Mr. Clegg says, a vessel of this kind, to contain 700 cubic feet of gas, will weigh about 20 cwt.

When the operation commences, the gazometer is sunk down nearly to a level with the surface of the water in the cistern L L; but as the gas enters, it rises up to receive it. It is to be noted, that the balance weights *f*, *f*, should not be quite so heavy as the gazometer, in order that some pressure may be exerted, to force the gas out of the burners with a proper jet. The gas which issues from the retort enters the receiver G, ascends the pipe *b*, into the vessel *d*, from which it displaces the water, and passes out at the small holes as before described, rising through the water into the gazometer, and raising it up: the gas then passes away to the burners. In this manner the process proceeds, until the whole of the volatile products of the coals in the retort is evaporated. The use of the gazometer is, to equalize the emission of the gas which comes from the retort more quickly at some time than others. When this happens, the vessel rises up to receive it, and when the stream from the retort diminishes, the weight of the gazometer expels its contents. When the process is finished, the retort is suffered to cool, and its lid is then removed to replenish it with coal. The caput mortuum, which is found in the retort, is the most excellent coak, and in value returns a considerable portion of the whole expence of fuel when the retort cools. The vessel *d* contains a sufficient quantity of gas to supply any absorption which takes place without raising the water into the retort.

In Mr. Clegg's original apparatus the chains for the balance weight are attached to the top of the gazometer; and the cistern L, for containing the water of the gazometer, is represented as a well sunk in the ground. This method is cheap and simple, though at the same time it is liable to have leaks, which are not easily discovered or accessible to be stopped; and it requires considerable length of pipes to draw off the matter from the receiver G; whereas in the construction represented in the plate, they are drawn off by the cock at *x*. Of these products we shall speak more in another place.

Figs. 2 and 3 represent one of the gas lamps on the principle of Argand; the space between the two concentric tubes *a*, *b*, is supplied with gas by a pipe, *c*, in which is a cock, *d*, to regulate or occasionally intercept the gas. The space between the two tubes is covered at top with a circular ring, shewn in *fig.* 2, pierced with a number of small holes, at which the gas issues, forming a cylinder of flame, to which a current of air is brought through the internal tube *d*. The air has also passage beneath the glass chimney, *f*, to supply the outside of the flame, which is rendered the most steady and regular imaginable, by the draught caused by the chimney: *g* is a small button affixed to a stem, which slides up and down in the interior tube with sufficient friction to retain its position. The button conveys the current of air rising through the tube in an expanded cone to the inside of the flame, and assists the combustion in a great degree.

The next apparatus for gas lights which we shall describe is by Dr. Stancliffe, as shewn in *fig.* 4. A is a vessel of cast-iron, forming the retort, and is set in brick-work in any proper furnace; E is a rim cast in the same piece, inclosing the top of the former, so as to make a deep groove all round in the top of the vessel. In this groove the head, F, of the vessel is received; and to make the fitting air-tight, a quantity of fusible alloy is placed in the groove. This melts by the heat of fire, and forms a fluid luting, which prevents the escape of the gas. G is a tube leading from the head to the refrigeratory E F; the joining of this tube with this vessel is formed by a joint, on a similar principle to the joining of the head with the retort: *a* is a tube passing through the lid of the vessel, and another, *b*, is fixed concentric to and surrounding the former at a small distance. The space between these is filled with water, and the tube, G, which connects with the head, is immersed in the water which forms the joint round the pipe, and by this means the tube, G G, and the head, F, of the retort, can be removed together to take out the coak and introduce fresh coals. The refrigeratory is made in two divisions E and F, one above the other; the tube G goes down nearly to the bottom of the lowest division, and the gas bubbles up from the end of it through the water, with which the lower partition is partly filled: it then passes out at the pipe, *d*, to the burners. These must not be of such a number as to consume the gas as fast as the retort produced it; by this means it will be under a considerable pressure in the vessel, which is found conducive to the separation of the tar, &c. When the gas comes over quickly from the retort, it presses upon the surface of the water, and causes it to ascend through the pipe, *e*, in the partition into the upper chamber, where its weight constantly acts to cause a pressure, and expel the gas at the pipe, *d*, whenever the supply of the retort diminishes; *f* is another pipe through the partition to allow the escape of the gas, if it forces out the water so low as the bottom of the pipe: the gas which then rises into the upper division gets away by the pipe *g* into the chimney of the funnel. Dr. Stancliffe has recently taken out a patent for the method of luting of the head and joint at G, as applied to the distillation of any other matter.

Fig. 5. is an apparatus by Mr. B. Cooke of Birmingham, recently communicated by him to the Society of Arts, and rewarded by them with a silver medal. The pipe A leads the gas from the pot or retort, and is fitted, in a manner similar to Dr. Stancliffe's, to a vessel B B, called the purifier. This is filled half full of water, and has five partitions, *a*, *a*, *a*, *a*, *a*, soldered to the lid, and extending beneath the surface of the water; at the lower edge a number of holes are pierced in the plates through which the gas issues, and rises in bubbles through the water on the opposite side. In this manner it proceeds through all the plates, and is by that means washed and purified most perfectly, the cold water condensing and depositing in the bottom of the vessel the tar and ammoniacal liquor, which can be drawn off by the cock

cock *h*; M is the pipe which conveys the gas away from the end of the purifier, and leads it to the bottom of the tube, L L, of the gazometer, which is omitted in the drawing, as it is the fame as in Mr. Clegg's apparatus, and furnifhed with balance weights in the fame manner: N is the pipe to take the gas away to the burners. Mr. Cooke has placed his connecting pipes, M and N, inclined, and at the loweft point a fhort pipe *n*, which is immerfed in the water contained in a veffel *m*, fo as to prevent the efcape of any gas, but at the fame time to allow any tar, &c. to drain down the pipe and depofit itfelf in the water. By this means the tar, which will unavoidably reft in thefe pipes, is difpofed of without danger of clogging or ftopping the paffage, as might happen in courfe of years, though the quantity was ever fo minute. Mr. Cooke recommends for dwelling-houfes, where the gas is required to be particularly free from fmell, that it fhould be paffed through a fecond purifier containing lime water, which will render it perfectly pure.

In any of thefe apparatufes, it is effential that the water ufed for wafhing and purifying the gas fhould be changed for frefh as foon as it becomes dirty; and unlefs this is done the gas will not be perfectly purified by wafhing, but retain an unpleafant fmell after it. The tar which depofits itfelf at the bottom of the veffel, in the confiftence of treacle or thick oil, is firft drawn off by the cock: for that purpofe this fubftance is found very ufeful, and in many points forms a fubftitute for the vegetable tar. By boiling it, the volatile parts are evaporated, and it becomes pitch. If the evaporation is performed in a retort, the matter which comes over is a fpirit, which, according to Mr. Cooke, may be ufed inftead of that kind of turpentine, known by the term tar fpirit, in painting and japanning: and he gives particular directions for the manner of performing this diftillation in the 28th vol. of the Tranfactions of the Society of Arts. The refiduum left in the retort is pitch; or, if further boiled, makes afphaltum, or a fubftance which is equally applicable, for the various arts in which it is employed.

It is proper that we fhould here notice Mr. Winfor's procefs for procuring gas, coak, and many other products, from pit-coal: but as this procefs has not been wholly made public, our notice muft be fhort. A company has been eftablifhed for the purpofe of carrying into execution his invention, and has applied to parliament for powers to act as a corporate body. Thofe who form this body, propofe to erect apparatufes, in convenient fituations, and convey the gas by pipes along the ftreets of a town, for the purpofe of lighting them, as well as the houfes. Experiments were made of this plan by lighting one fide of Pall Mall, in London, which appeared to anfwer well; and the company's houfe has been conftantly lighted and heated by gas fince the firft eftablifhment.

Mr. Winfor, at the opening of the bufinefs, gave lectures and experiments on the gas, though the manner of procuring and purifying it he kept a fecret: he exhibited the mode of conducting it through the houfe, and a number of elegant devices for chandeliers, &c. by which it was confumed. Among thefe he propofed long flexible tubes fufpended from the ceiling of the room, and at the end communicating with a burner, which was defigned with much tafte, being a cupid holding a torch in one hand, and grafping the tube, in the fame manner, as a rope in the other. This figure was to be fufpended by hooks in any convenient part of the room where light was required, and might be carried into any clofet or other place within the limits of the length of the tube. He fhewed alfo by experiments, that the flame of the gas was not liable to be extinguifhed by wind or rain, that it produced no fmoke, and was not fo dangerous as the light of lamps or candles, as it could not produce fparks.

A pamphlet has been recently publifhed by Mr. Van Voorft, ftating the evidence taken before the committee of the houfe of commons appointed upon the bill, for the incorporation of the Gas Light Company. This gentleman ftates the products of a London chaldron of coals, treated in Mr. Winfor's procefs, to be, 1ft, light by the combuftion of the gas equal to 2,100 parifh lamps burning 11 hours: 2d, $1\frac{1}{2}$ chaldron of coak by admeafurement: 3d, 60lbs. of pitch: 4th, three gallons of effential oil: and, 5th, 18 gallons of ammoniacal liquor; and he enters into a calculation of the pecuniary profits; but this we forbear to detail, as being entirely dependent upon the local fituation and value of the coals and their products. This ftatement is collected chiefly from the evidence of Mr. Accum. The bill was rejected by parliament; but we underftand, by the above pamphlet, that the company intend to profecute their undertaking without a charter of incorporation.

Mr. Murdoch made a communication in 1808 to the Royal Society on the fubject of gas light, and was complimented with count Rumford's medal for the fame. He gives the refults of the procefs as conducted in the cotton mills of Meffrs. Phillips and Lee, at Manchefter, who have a very large apparatus conftructed by Mr. M. at the Soho works. The gas lights are equal to 2500 mould candles of fix in the pound, each candle confuming 175 grains of tallow per hour. The number of burners are 271 Argands, and 633 cockfpurs, fo called from having three jets diverging from each other. Thefe require an hourly fupply of 1250 cubic feet of gas to produce, which requires feven cwt. of cannel coal in the retort, and about one third of that quantity of good common coal to heat the retort. The cannel coal in the retort produces nearly $4\frac{1}{2}$ cwt. of good coak, and $4\frac{1}{2}$ ale gallons of tar. The ammoniacal liquor was not regarded, as it has not yet been applied to any manufacture, fo as to be demanded in large quantities; though a paper by Mr. Wm. Cox will be found in Mr. Van Voorft's pamphlet, fhewing the advantages of the ammonia as applied for manure, and fome other experiments on its ufe in dyeing. See FLAME.

GASBORN, in *Geography*, a town of Sweden, in the province of Warmeland; 43 miles N. of Carlftadt.

GASCOIGN, or *Bezoardic Powder*, in *Medicine*, is formed of the compound powder of crab's claws one pound, of oriental bezoar prepared one ounce: this powder is made up into balls, called Gafcoign balls, from the name of their inventor. This is omitted in the modern Pharmacopœias, as having no advantage over the prepared oyfter-fhells.

GASCOIGNE, *Sir* WILLIAM, in *Biography*, who flourifhed in the reign of Henry IV., was nobly defcended of an ancient family in Yorkfhire. He was born at Gawthorp, near Leeds, about the year 1350; was a ftudent in the law in the Inner Temple, and became a member of that fociety. About the year 1398 he had attained to fuch eminence in his profeffion, that he was made one of the king's ferjeants. From this period he was diftinguifhed for his found legal knowledge, and fidelity, in the tranfaction of the moft intricate and important affairs, as well relating to his own rights as thofe of the kingdom at large. How much he was employed on all great queftions appears from the parliament rolls and other ancient records. From the firft year of Henry IV., who began his reign in September 1399, to the latter end of it, we meet with the abftracts of Gafcoigne's opinions, arguments, diftinctions, and decifions, as well before he was chief juftice as after, very frequently recited, among thofe of other fages of the law, in our old books of Reports, many of which are diftinguifhed and recommended, by the remarks of the editor, as worthy of obfervation, and may give good lights in our old law cafes. It appears,

pears that he was made lord chief juftice of the king's bench fo early as the year 1401. And in 1405 he was appointed with others, by the king, to treat with thofe who had acted in rebellion againft the exifting government; and foon after, when archbifhop Scrope and others were taken with arms in their hands againft the king, his majefty would have had his chief juftice pronounce upon them fentence of death without waiting the forms of trial, but Gafcoigne maintained the law with fo much integrity, that he refufed to conform himfelf to the king's wifhes, though by this refufal he incurred his fovereign's difpleafure. The anger of the king was but of fhort duration, for we find that he prefented his judge with the honour of knighthood that fame year. It was towards the latter end of this reign that the judge teftified his regard to the law of the land, which fhould bow to none, however high in rank, and in the prince and heir to the crown, Gafcoigne gave an example which has been applauded by all writers from that time to the prefent. A riotous companion of the prince's had been indicted before the chief juftice for fome diforders which had been committed, probably, either in the company of the prince or at his inftigation. The young man appeared at the bar with the criminal, to give him countenance and protection, or to avert the due courfe of law. Finding that his prefence had not overawed the ftern magiftrate, he proceeded to infult him in the difcharge of his duty, but Gafcoigne, regardlefs of every confideration except that which the law of the land required, and recollecting that he was placed in that high ftation to adminifter juftice, committed the prince himfelf to cuftody, for his rude behaviour, there to wait his father's pleafure; "but in fuch venerable, fuch coercive expreffions; wherein the paternal authority of the king was fo enforced by the awful gravity of the judge, that the prince's calm fubmiffion to the punifhment was no lefs fudden and furprifing, than the outrageous offence had been which drew it upon him." An attempt was made by fome of the courtiers to alienate the king's affections from the judge on account of his inflexible behaviour towards the heir apparent; but the monarch exclaimed, that he thanked his Maker, who had given him both a judge who could minifter, and a fon who could obey juftice. The judge perfevered to the end of his life in the honeft difcharge of his official duties. He died in the year 1413, and a funeral was granted him proportionable to his eminent dignity and high fame. Upon his monument were his effigies at length. He is reprefented in his judge's robes, with his hood on, a large purfe faftened to his girdle on his left fide, and a long dagger on the right. Biog. Brit. Hume's Hift.

GASCONADE, a boaft or vaunt of fomething very improbable.

The term has its rife from the Gafcons, or people of Gafcony, in France, who, it feems, have been diftinguifhed for bragging and rhodomontado.

Gasconade *River*, in *Geography*, a river of Louifiana, which runs into the Miffouri. N. lat. 38° 30′. W. long. 92° 20′.

GASCONY, Vasconia, in *Geography*, a province of France before the revolution, comprehending the fouth divifion of the government of Guienne, was bounded on the north by Guienne, on the eaft by Languedoc, on the fouth by the Pyrenées, and on the weft by the ocean, and lay between 42° 35′ and 44° 30′ N. lat., and between 1° 40′ W. long. and 1° 20′ E. long., being 50 leagues from weft to eaft, and from 20 to 30 in breadth. This province derives its name from the Gafcons, or Vafcones, a tribe in Spain that defcended from the Pyrenean mountains towards the conclufion of the fixth century, and took poffeffion of Novempopulani. After their reduction by Theodebert, in 602, they revolted feveral times, but were finally fubjected by Charlemagne. Thefe Gafcons poffeffed a confiderable degree of fpirit; but they were fo apt to exaggerate in defcribing their exploits, as to render the term "Gafconade" proverbial. Gafcony is compofed of the following diftricts, *viz.* Armagnac in the centre; Bigorre, Soulz, and Labour on the fouth; Chaloffe and Landes on the weft; Coudomois and Lomagne on the north; and on the fouth Comminges and Couferans. The principal rivers are the Adour, the Save, Gimone, Arrats, Gers, Baize, Loffe, Nefte, and Gave.

GASCUENA, a town of Spain, in the province of New Caftile; 30 miles N.W. of Cuença.

GASH, or Gaw, in *Mining*, is one of the numerous appellations for a fault or break of the ftrata. See Fault.

GASHOLMA, in *Geography*, a fmall ifland on the W. fide of the gulf of Bothnia. N. lat. 61° 1′. E. long. 17° 5′.

Gasholma, *Ofter*, a fmall ifland on the W. fide of the gulf of Bothnia. N. lat. 61° 57′. E. long. 17° 20′.

Gasholma, *Wefter*, a fmall ifland on the W. fide of the gulf of Bothnia. N. lat. 61° 57′. E. long. 17° 17′.

GASIMA, a town of Japan, near the eaft coaft of Niphon; 45 miles N.E. of Jeddo.

GASKETS, on *Ship-board*, the fmall cord ufed to faften the fails to the yards when furled up.

GASMAN, Floriano, in *Biography*, a German mufical compofer of the Vienna fchool, born in Bohemia, 1729. He diftinguifhed himfelf, not only in his own country, but in Italy, where he compofed four ferious operas and three comic, which had confiderable fuccefs; but no one fo much as the comic opera, "L'Amore Artigiano," compofed for Vienna, which, in 1770, when the Baglioni family from Bologna, confifting of fix fifters, all fingers, and Garibalde, were at Milan, had a very extraordinary run in that city, and afterwards was in very high favour all over Italy and throughout Europe, wherever there was an Italian lyric theatre.

In 1772 Gafman was at Vienna, and had been appointed not only maeftro di cappella to the emperor Jofeph II., but infpector of the Imperial mufical library; honours to which his worth, genius, and talents well entitled him. This ingenious compofer was fometimes accufed of want of fire in his theatrical compofitions; but the gravity of his ftyle is eafily accounted for, by the time and pains he muft have beftowed on church mufic. To aim at equal perfection in both, is trying to ferve God and Mammon; and thofe excellent compofers for the church, whofe works have furvived them, fuch as Paleftrina, Tallis, Birde, Allegri, Benevoli, Colonna, Caldara, Marcello, Lotti, Perti, and Fux, have chiefly confined themfelves to the church ftyle. Aleffandro Scarlatti, Handel, Pergolefi, and Jomelli, are exceptions. But, in general, thofe fucceed beft in writing for the church, ftage, or chamber, who accuftom themfelves to that particular fpecies of compofition only.

We do not call every modern oratorio, mafs, or motet, church mufic; as the fame compofitions to different words would do equally well, indeed often better, for the ftage. But by mufica di chiefa, properly fo called, we mean grave and fcientific compofitions for voices only, of which the excellence confifts more in good harmony, learned modulation, and fugues upon ingenious and fober fubjects, than in light airs and turbulent accompaniments.

This author's works were very voluminous for a compofer to whom longevity was not granted; for he died at Vienna in 1775, at only 45 years of age, after compofing for the ferious opera, in Italy, Merope, Iffipile, Catone in Utica, Ezio, twice, and

Achille in Sciro: at Vienna, Olimpiade, Amore di Psiche, and Il Trionfo d'Amore. For the comic opera, at Venice, l'Uccilatore, twice: il Filosofo inamorato, un Pazzo ne fa Cento, and il Mondo nella Luna. At Vienna, i Viaggiatori ridicoli, l'Amore Artigiano, la Notte Critica, l'opera Seria, la Conteſſina, il Filoſofo inamorato a ſecond time, la Peſcatrice, and i Rovinati; beſides a great number of curious quartets, for various inſtruments, which we believe were never printed; but, having been favoured with MS. copies of them by the author himſelf, it is but juſtice to ſay, that, upon trial, we found them excellent: there are pleaſing melodies, free from caprice and affectation; ſound harmony, ingenious contrivances, and imitations, without the leaſt confuſion. The ſtyle is ſober and ſedate, without dulneſs, and maſterly without pedantry.

Theſe quartets, having been compoſed more than 30 years ago, are not ſo highly ſeaſoned as thoſe of Haydn and Mozart; but for thoſe who have not kept pace with the times, and are fond of plain food, they would perhaps be the more palatable.

GASMARK, in *Geography*, a town of Sweden, in the province of Warmeland; 30 miles E. of Philipſtal.

GASNITZ, a town of Bohemia, in the circle of Saatz; ſix miles E. of Eger.

GASPAR, in *Biography*, is the name of one of the moſt ancient contrapuntiſts of whoſe works any remains can be found. He is frequently mentioned by Franchinus among the moſt delightful compoſers of his time. He was contemporary with Juſquin; and among the maſſes and motets that were found printed under a patent granted by Leo X., preſerved in the Britiſh Muſeum, there is a maſs by Gaſpar, probably a native of France or Flanders. The compoſition of this maſs, which is upon the ſubject of an old ſong, *N'as tu Pas*, is excellent with reſpect to harmony; and the points of imitation are ſuch as would not diſgrace Paleſtrina, or even a much more modern author, as to melody, though printed in 1508, and probably compoſed in the preceding century. Though the names of Orpheus, Amphion, and Linus, have long ſurvived their works, we ſhall only record the names of muſicians, of whoſe abilities ſome ſpecimens are ſtill to be found.

GASPAR *Iſland*, or *Glaſſa*, in *Geography*, a ſmall iſland in the Eaſtern ſea, which gives name to a channel between the iſlands of Banca and Billiton, called "Gaſpar Straits." S. lat. 1° 55'. E. long. 107° 5'.

GASPARINI, Francesco, in *Biography*, a native of Lucca, director of the Conſervatorio of La Pieta at Venice, Filarmonico at Bologna, and one of the greateſt maſters of his time.

His firſt publication was a book of twelve chamber cantatas, for a ſingle voice, ſmall 4to. Lucca, 1697. They are graceful, elegant, natural, and often pathetic; leſs learned and uncommon than thoſe of Aleſ. Scarlatti; but, for that reaſon, more generally pleaſing and open to the imitation and pillage of compoſers gifted with little invention.

In 1703, his uſeful little work, intitled "L'Armonico Pratico al Cembalo," firſt appeared at Venice, conſiſting of only 86 pages 4to. But by regular ſtudy and long experience, he knew what young muſical ſtudents chiefly wanted, and has ſupplied it in the ſhorteſt and cleareſt manner poſſible, in ſo ſmall a compaſs. He confines himſelf to accompaniment on keyed-inſtruments, a ſubject which had not been excluſively treated before in Italy, nor do we know of any elementary work that has appeared there ſince, of equal utility. It is divided into the following twelve chapters:

I. Names and poſition of the keys.

II. Method of forming harmony by concords.

III. Accidental characters.

IV. Method of accompanying the hexachord, in a gradual aſcent, and by leaps.

V. Method of accompanying the hexachord in a gradual deſcent, and in wider intervals.

VI. The harmony of all kinds of cadences.

VII. Of diſcords, their preparation and reſolution, and of binding notes and ſyncopation.

VIII. Method of acquiring the art of accompaniment in all keys, and modulating out of one key into another.

IX. Of licences in the harmony of recitatives. See Acciacatura.

X. Of breaking chords into groups, and of ornamenting and embelliſhing the harmony.

XI. Of dividing and flouriſhing the chords.

XII. Method of tranſpoſition, into every key, by means of imaginary clefs.

This little work, in 1764, had gone through five editions. But on the 4th edit. in 1754, M. Laborde (Eſſais ſur la Muſ. tom. iii. p. 544.) obſerves, that "it proves harmony to have made a very ſlow progreſs in Italy, &c. Gaſparini not being arrived at the règle de l'octave." But did the French themſelves, or any other people, follow that rule, or the fundamental baſe, when Gaſparini's book was publiſhed? And does the counterpoint of Durante, Jomelli, Galuppi, Piccini, or Sacchini, manifeſt a want of rules or knowledge of harmony?

In 1702, this elegant compoſer ſet the opera of "Tiberio" for Venice; and between that period, and 1723, he produced 25 operas for that city only, beſides a great number for Rome and other places.

He ſeems to have been the firſt opera compoſer who aimed at grace in his melodies, and who ſteered between the extremes of ſimplicity and pedantry.

When Quantz went to Rome in 1724, he found Gaſparini ſtill living, took leſſons of him in counterpoint, and his good nature and probity ſeem to have made as deep an impreſſion upon Quantz, as his muſical abilities.

He was at this time 72 years of age; and ſeems to have continued writing till he was near fourſcore: the laſt opera in Quadrio's liſt of his muſical dramas bearing date 1730.

He was the maſter of Domenico Scarlatti, and of Benedetto Marcello. A letter of his writing is printed in Marcello's Pſalms, in anſwer to one from his noble and illuſtrious pupil; and in the works of Metaſtaſio, there is a ſonnet by that exquiſite lyric poet on Gaſparini. When his "Merope" was performed at Rome in 1721, there was in it a ſcene of recitative which has been ſaid to draw tears from the whole audience.

During the reſidence of Aleſſandro Scarlatti at Naples, he had ſo high an opinion of Franceſco Gaſparini, then a compoſer and a harpſichord maſter of great eminence at Rome, that he placed his ſon Domenico, while a youth, to ſtudy under him in that city. This teſtimony of confidence in his probity and abilities gave birth to a ſingular correſpondence between theſe two great muſicians. Gaſparini compoſed a cantata in a curious and artful ſtyle, worthy the notice of ſuch a maſter, and ſent it as a preſent to Scarlatti: "Cantata inviata dal Signor Franceſco Gaſparini al Signor Aleſ. Scarlatti."

To this muſical epiſtle Scarlatti not only added an air, by way of poſtſcript, but replied by another cantata of a ſtill more ſubtile and artificial kind, making uſe of the ſame words: "Cantata in reſpoſta al Signor Gaſparini, del Sig. Aleſ. Scarlatti, Eumana." This reply produced a rejoinder from Gaſparini,

Gafparini, who fent Scarlatti another cantata, in which the modulation of the recitative is very learned and abftrufe.

Scarlatti, feemingly determined to have the laft word in this cantata correfpondence, fent him a fecond compofition to the fame words, in which the modulation is the moft extraneous, and the notation the moft equivocal and perplexing, perhaps that were ever committed to paper. This is entitled "Seconda Cantata del Signor Alef. Scarlatti in Idea Eumana, ma in regolo Cromatico, ed è per ogni profeffore."

Francefco Gafparini's twelve cantatas, of which the fecond edition was printed at Lucca 1697, were the firft productions that he publifhed. There is a movement in his fecond cantata which would remind all who are acquainted with Dr. Pepufch's celebrated cantata "Alexis," of the air "Charming founds that fweetly languifh."

Gasparini, Michael-Angelo, a native likewife of Lucca, ftudied under Lotti, was an eminent theatrical finger with a counter-tenor voice, and afterwards an excellent compofer. His ftyle of finging and good tafte acquired him great reputation.

He had many fcholars as a finging-mafter, who became illuftrious; among the reft the celebrated Fauftina. Having for a long time fung the mufic of others, he, in turn, made others fing his mufic, and compofed many operas which pleafed.

GASPARINO, Barziza, an Italian poet, was born, towards the clofe of the 14th century, at Barziza, a place in the Bergamafque, whence he derived his furname. He acquired, at an early period, a tafte for the good authors of antiquity, and taught others what he had learnt himfelf. He became a profeffor of belles lettres at the univerfity of Pavia about the beginning of the 15th century, from whence he paffed to Venice, and undertook the profefforfhip of moral philofophy at Padua. About this period, by the death of his elder brother, in very ftraightened circumftances, he took upon himfelf the heavy charge of maintaining his eight children, which reduced him to fuch a ftate of indigence, that he was compelled to fell his books. In 1418, he opened a public fchool at Milan, by the order, and under the patronage of the duke, and his leifure hours he employed in giving private inftructions to young perfons, and in copying and correcting the MSS. of ancient authors. He died about the year 1431, leaving behind him feveral fhort treatifes on grammar and rhetoric; orations compofed upon various occafions; letters to his friends, which paffed through feveral editions; and other epiftles written by way of exercife as models to his pupils. His death was univerfally lamented by the city of Milan, and his merits and great learning were highly extolled by contemporary writers. Moreri.

GASPE Bay, in *Geography*, a bay on the eaft coaft of Lower Canada, and weft fide of the gulf of St. Lawrence.

Gaspe, *Cape*, a cape on the coaft of Canada, in the gulf of St. Lawrence, a little S. of Gafpe bay; near which is an Indian fettlement.

GASPEE, a diftrict and county of Lower Canada, comprehending the point of land, bounded by the river and gulf of St. Lawrence on the north and eaft, and the bay of Chaleur S. and S.W.

Gaspee, or *Namquil Point*, a point feven miles S. of Providence, Rhode ifland, projecting from the weftern fhore of Providence river; fo called from the name of the Britifh fchooner Gafpee, which was burnt June 10, 1772, by about 60 men from Providence, painted like Narraganfet Indians.

GASPESIA, a tract of country on the S. fide of the mouth of St. Lawrence river, and on the N. fide of Chaleur bay, in Lower Canada. Its eaftern extremity is cape Rofiers. It is inhabited by Indians, called Gafpefians.

GASSAGO, a town of Italy, in the department of the Mela; 3 miles N.W. of Brefcia.

GASSEN, a town of Lower Lufatia; 15 miles S.E. of Guben.

GASSENDI, Peter, in *Biography*, a French philofopher of diftinguifhed eminence, was born in 1592 at Chanterfier, near Digne, in Provence. At the early age of four years he manifefted that pious difpofition and thofe extraordinary talents, by the cultivation and exercife of which he acquired future celebrity. It was in this period of his infancy that he began to direct his attention to the heavens, and to avail himfelf by retirement of every favourable opportunity that occurred for contemplating them with fatisfaction and advantage. His parents obferved thefe dawnings of genius with delight, and though their circumftances were moderate, they determined to give him the beft education in their power. With this view, he was firft placed under the inftruction of an excellent mafter at Digne, where, by his proficiency in the Latin language, and in rhetorical exercifes, he laid the foundation of the high degree of reputation to which he attained in early life. From Digne he was removed to Aix, where, for two years, he devoted himfelf to the ftudy of philofophy under an eminent profeffor. At the age of 16 years he was appointed teacher of rhetoric at Digne; and at 19, profeffor of philofophy in the univerfity of Aix. Whilft he neglected no opportunity that occurred of profecuting his ftudies in the learned languages, and alfo in mathematics and aftronomy, he diligently examined the ancient fyftems of philofophy, and adopted that of Epicurus, which he preferred to every other, and of which he approved himfelf afterwards a very ingenious and zealous advocate. Although the authority of Ariftotle was acknowledged in all public fchools, Gaffendi, during the exercife of his profefforfhip at Aix, ventured publicly to expofe the defects of his fyftem. The lectures which contained his cenfures of the Ariftotelian philofophy, delivered in the indirect form of paradoxical problems, were publifhed under the title of "Exercitationes paradoxicæ adverfus Ariftotelem." This work, which gave great offence to the partizans of Ariftotle, was held in high eftimation by feveral learned men, particularly by Nicolas Peirefc, the prefident of the univerfity of Aix; and induced him to ufe his intereft for admitting the author to the degree of doctor of divinity, and to a canonry in the church of Digne. Having obtained thefe preferments, he refigned his profefforfhip in Aix, and in his retirement at Digne purfued his philofophical and aftronomical refearches. A fecond volume was afterwards publifhed, the object of which was to expofe the futility of the Ariftotelian logic. The author was difcouraged from profecuting the plan he had propofed, and induced to defift from all direct attacks upon the philofophy of Ariftotle, by the oppofition of his bigotted and intolerant advocates; neverthelefs he avowed his attachment to the fyftem of Epicurus, and then defended it with great ability and learning. Accordingly he undertook to frame from Lucretius, Laertius, and other ancient writers, a confiftent fcheme of Epicurean doctrine, in which the phenomena of nature are immediately derived from primary atoms. But, aware of the fundamental defect of this fyftem, he added to it the doctrine of a fuperintending deity, who firft moved and fubfequently arranged thofe atoms, and whom he regarded as the wife governor of the world. The atomic doctrine was ftrenuoufly maintained by Gaffendi, in oppofition to the fictions of the Cartefian philofophy, which were then gaining ground; and he

he particularly afferted and vindicated the doctrine of a vacuum. On the fubject of morals, Gaffendi explained the permanent pleafure or indolence of Epicurus, in a manner perfectly confiftent with the pureft precepts of virtue.

In order to extend his acquaintance with learned perfons, Gaffendi, in the year 1628, vifited Holland, where his philofophical and literary merit was acknowledged and refpected by many admirers and friends. During his abode in this country, he formed an intimacy with the learned Merfennus, and wrote an elegant and judicious apology for him in reply to the cenfures of Robert Fludd, on the fubject of the Mofaic philofophy. Upon his return to France, he renewed his application to aftronomy, and profecuted a feries of celeftial obfervations, with a view of completing his fyftem of the heavens. At Paris he recommended himfelf, by his agreeable manners, as well as by his acknowledged reputation for literature and fcience, to perfons moft diftinguifhed for learning, and alfo for high rank, in that capital. By the intereft of the cardinal of Lyons, the brother of cardinal Richelieu, he was appointed, in the year 1645, regius profeffor of mathematics at Paris; an office, the primary duties of which he difcharged by reading lectures on aftronomy, which were attended by crowded auditories, and which, fully anfwering the high expectations that had been previoufly entertained, contributed to eftablifh and maintain his popularity. The fatigues of his public labours, added to his intenfe application in the profecution of his private ftudies, exhaufted the ftrength of his conftitution; and having caught a cold, which occafioned an inflammation of his lungs, he was obliged, in the year 1647, to leave Paris, and to return to Digne, for the benefit of his native air. Having obtained fome temporary relief by an intermiffion of his ftudies, he returned to Paris in the year 1653. Here he publifhed the lives of Tycho Brahe, Copernicus, Purbach, and Regiomontanus; but refuming his aftronomical labours with his accuftomed ardour, his diforder returned, and he funk under it, in the year 1655, in the 63d year of his age. Juft before he expired, he laid his hand upon his heart, and remarking the feeble ftate of its pulfation, he faid to his attendant, "See, how frail is the life of man!"

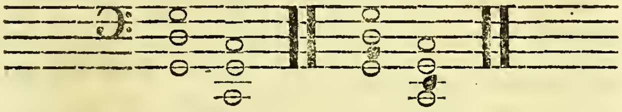
Gaffendi was eminently diftinguifhed among his contemporaries by the foundnefs of his judgment, the extent of his reading, the capacioufnefs of his memory, and the intenfenefs of his application; and thus diftinguifhed, he attained to pre-eminence among the philofophers of the period in which he lived. Our learned Barrow ranks him among the moft eminent mathematicians of the age, and mentions him in connection with Galileo, Gilbert, and Des Cartes. His commentary upon the 10th book of Diogenes Laertius exhibits him to fingular advantage, with regard to profound erudition and fkill in the languages. By his oppofition to the philofophy of Des Cartes, already noticed, he formed a refpectable party among the philofophers of his time, denominated Gaffendifts, in contradiftinction to the other prevalent party, known by the appellation of Cartefians. The latter were much more numerous than the former; for Gaffendi had few difciples in his own country; but among the Englifh, who in his time were remarkable for their application to ftudies of a phyfical and mathematical kind, a confiderable number adopted his philofophical fyftem. It is remarkable, that even thofe eminent philofophers and divines, fuch as Whichot, Gale, Cudworth, and More, who entered the lifts with Hobbes, (whofe doctrine came nearer to the principles of Gaffendi than to the fyftem of Des Cartes), and revived ancient Platonifm, in order to crufh under its weight the philofopher of Malmfbury, placed Gaffendi and Plato in the fame clafs, and explained the fentiments of the latter in fuch a manner, as to appear quite agreeable to the principles of the former. To this period many trace the origin of the two philofophical fects, called the *mathematical* and *metaphyfical*, which fee. The controverfy between Gaffendi and Des Cartes led to feveral mutual cenfures and reproaches on the part of their refpective advocates. Whilft Des Cartes and his metaphyfical followers were accufed of ftriking at the foundations of all religion, Gaffendi is charged by Arnauld with overturning the doctrine of the foul's immortality in his controverfy with Des Cartes, and by Leibnitz with hefitating and wavering too much concerning the nature of the foul, and the principles of natural religion. The literary conteft between thefe two philofophers had betrayed them both into the ufe of fome irritating expreffions, which had produced a mifunderftanding and coolnefs, that were much lamented by their friends; and attempts were made for effecting a reconciliation between them. The abbé d'Eftrees, afterwards cardinal, took the lead in this laudable undertaking, and convened them, and feveral of their friends, among whom were father Merfenne, Roberval, the abbé de Marolles, and others, to a public dinner; Gaffendi was prevented by illnefs from attending; but fo intent was the abbé d'Eftrees upon accomplifhing his purpofe of reconciliation, that he took his guefts with him to Gaffendi's apartments; where they had the pleafure of hearing thefe two philofophers making mutual apologies for improper irritability, and declaring to each other, that whatever difference of opinion might after this interview fubfift between them, it fhould produce no interruption of their friendfhip. The firft tranfit of mercury over the fun, which had been predicted by Kepler to take place on the 7th of November, 1631, was obferved by Gaffendi. From his letters it appears, that he was on terms of intimacy with Kepler, Longomontanus, Snellius, Hevelius, Galilee, Kircher, Bullialdus, and other celebrated aftronomers of that age, and that he was often confulted by them; and his labours entitle him to a high rank among the founders of the reformed philofophy. His large and valuable library, together with his aftronomical and philofophical apparatus, was purchafed by the emperor Ferdinand III., and afterwards depofited, with other choice collections, in the Imperial library at Vienna. The MSS. which he left behind him, and the treatifes publifhed by himfelf, were collected after his death, and, accompanied with the author's life, publifhed by Sorbiere, in fix volumes folio, in 1658. They confift of the philofophy and life of Epicurus; the author's own philofophy; his aftronomical works; the lives of Peirefc, Copernicus, Tycho Brahe, Purbach, Regiomontanus, John Muller, &c.; a refutation of the Meditations of Des Cartes; Epiftles; and other treatifes. Bernier, a celebrated French phyfician, has given an accurate view of the philofophy of Gaffendi in his abridgment of it, publifhed in French at Lyons, in the year 1684, in eight volumes 12mo. This abridgment will give the reader a clearer account of this philofophy than even the works of Gaffendi himfelf, in which his meaning is often expreffed in an ambiguous manner, and which are alfo loaded with fuperfluous erudition. The life of Gaffendi, accurately written by Bougerelle, a prieft of the oratory, was publifhed at Paris in 1737. Nouv. Dict. Hift. Brucker's Hift. of Philof. by Enfield, vol. ii. p. 464, &c. Mofheim Eccl. Hift. vol. v.

In the 5th vol. of his works, printed at Lyons in 1658, we find a tract on the theory of mufic: "Manuductio ad Theoriam Mufices." But this is confined merely to harmonics. He there demonftrates, with Des Cartes and Père Merfenne, why the 4th, as a perfect concord, is more pleafing in the acute than the grave. All thefe philofophers, with

with the ancients, allow the 4th to be a concord, though, in counterpoint, the leaſt pleaſing of all. Des Cartes, the moſt ſevere of the ſcientific triumvirate, ſays, (Compend. Muſi. pag. 19. de Quarta) "Hæc infæliciſſima eſt conſonantiarum omnium, nec unquam in cantilenis attribuetur, niſi per accidens, et cum alterius adjumento, nec quidem quod magis imperfecta ſit quam tertia minor, aut ſexta, ſed quia tam vicina eſt quintæ, ut coram hujus ſuavitate tota illius gratia evaneſcat."

Organiſts have long obſerved that cloſe intervals in the baſe, though conſonant, are diſagreeable, and never, in full playing, give the 3d in a common chord with the left hand in the baſe.

omitting the 3d. thus, never thus.



GASSION, John de, a marſhal of France, was born in 1609 at Pau, where his father was preſident of the parliament. Being intended for the army, he, at the age of 16, entered into the gendarmes of the prince of Piedmont; and in 1627 he ſerved under the duke de Rohan in the civil wars with the Calviniſt party, to whom he was always attached. He next joined himſelf to Guſtavus, and was made captain of his body guard, and ſhortly after raiſed to the rank of a field officer in the cavalry, in which poſt he performed eſſential ſervices in ſeveral actions, eſpecially at the battle of Leipſic. Guſtavus was ſo highly pleaſed with his valour in the field and his fidelity in council, that he determined to diſtinguiſh him by ſome ſignal recompence; but the death of that great man at Lutzen prevented the execution of his well meant intention. (See Gustavus.) Gaſſion now returned to France with his regiment, and entered under the marſhal de la Force in Lorrain, where he performed many remarkable exploits, and where he became a terror of the enemy. At the ſiege of Thionville he received a dangerous wound, for which he was recompenſed in 1643 with a marſhal's ſtaff, and in the following year he was appointed lieutenant-general of the army in Flanders. He now performed the moſt brilliant actions, and was entruſted with highly important poſts, but when he had apparently attained to the height of his reputation, he received a mortal wound at the ſiege of Lens in 1647, and was buried in the pariſh church at Charenton. His hiſtory has been publiſhed by the abbé de Pure, in four volumes 12mo. He has been characteriſed as a military man by a daring courage and ſpirit of enterpriſe, which ſet at defiance all common obſtacles. "Theory," he ſaid, "was good in the cloſet, but boldneſs and action are the requiſites in the field." At another time he exclaimed, "I have that in my head and at my ſide which will overcome pretended impoſſibilities." Cardinal Richelieu had ſo full a confidence in him, that when urged by uncommon difficulties he uſed to ſay, "They will be readily removed by Gaſſion." Moreri.

GASSO, in *Geography*, a town of France, in the department of the Po; five miles S. of Chivaſſo.

GAST Hound. See *Gaze* Hound.

GASTALDUS, or Castaldus, an officer anciently entertained in the courts of divers princes.

The word is alſo written *gaſtaldius, gaſtaldio, gaſtaldatus, guaſtaldus*, &c. Macri derives it from the Arabic *chaſendar*, purveyor of a houſe; others from the German *gaſt*, and *halten*, to retain travellers.

The gaſtaldus was what in Italy and Spain is now called *major domo, viz.* the maſter and ſteward of a houſehold. The gaſtaldus was a comes, or count; which ſhews his office to have been very conſiderable.

In the laws of Italy, we ſometimes alſo meet with gaſtaldus in the ſenſe of a courtier, and ſometimes as an eccleſiaſtical officer; ſo that it is ſomewhere expreſſed to be ſimony to buy the function of gaſtaldus.

GASTALDY, John Baptist, in *Biography*, a doctor of the faculty of medicine at Avignon, and phyſician in ordinary to the king of France, was born at Siſteron, in 1674. He went while very young to Avignon, and finding that this city would afford him ample means of gratifying his taſte for ſtudy, he took up a permanent reſidence. He was an honour to the faculty, and filled the firſt chair of medicine for upwards of forty years; poſſeſſing the rare talent of uniting the uſeful with the agreeable, and, by this charm, attaching the ſtudent to his art. He devoted much of his time to practice, more particularly in the hoſpitals, and his value was acknowledged by the citizens of Avignon during the plague, which ravaged that place in the year 1720. Gaſtaldy died at Avignon in 1747. His principal work is the following; "Inſtitutiones Medicinæ Phyſico-Anatomicæ," 1713. Several Queſtions in Phyſic were publiſhed by him at different times reſpecting intereſting topics in phyſiology and medicine. Eloy. Dict. Hiſt.

GASTAUD, Francis, who flouriſhed in the beginning of the eighteenth century, was deſcended from a family of diſtinction, and born at Aix in Provence. Having received an education adapted to the purpoſe, he was at an early age admitted into orders, and officiated for ſome years as prieſt in the pariſh church of St. Paul. He was greatly admired as a preacher, and publiſhed ſeveral theological pieces, among which was "A Collection of Homilies on the Epiſtles to the Romans," in two volumes, 12mo. To this work is prefixed an excellent delineation of the character of St. Paul. On the death of his elder brother, a celebrated advocate in the parliament of Provence, he determined to embrace the ſame profeſſion. With this deſign he retired into the country, and applied moſt diligently to the ſtudy of the law. He then took his degrees, was admitted an advocate, and practiſed with uncommon ſucceſs. The intereſts of the poor he advocated without hope of reward; and in 1717 he gained a famous cauſe againſt the Jeſuits, of whom he was an active opponent. Not contented with pleading profeſſionally againſt them, he attacked them by means of the preſs, and wrote a bitter piece, entitled "The Jeſuits unmaſked." He publiſhed ſome treatiſes againſt the biſhop of Marſeilles, which occaſioned him to feel the ſevere vengeance of that prelate, at whoſe inſtance he was exiled twice to Viviers, where he died in the year 1731, and on account of his reputed hereſy he was denied the rights of Chriſtian burial. Moreri.

GASTE, St., in *Geography*, a town of the county of Tyrol; 20 miles S.W. of Bolzano.

GASTEIN, a town of the archbiſhopric of Salzburg, celebrated for its warm baths and mines of lead, iron, and gold; 36 miles S. of Salzburg.

GASTEL, a river of Wales, which runs into the Conway, in the county of Carnarvon.

GASTER, in *Anatomy*, (from the Greek γαςηρ), the *ſtomach*. In the ancient writers on medicine, the word is ſometimes applied to the abdomen in general, or to the uterus.

Gaster, in *Geography*, a bailiwick of Switzerland, belonging to the canton of Schweitz and Glaris, to which it was ſold by the houſe of Auſtria in 1438.

GASTE-

GASTEROSTEUS, in *Ichthyology*, a genus of the thoracic order, diſtinguiſhed by the following eſſential character; the head oblong and ſmooth; jaws armed with minute teeth; tongue ſhort and obtuſe; palate ſmooth; eyes moderate, ſlightly prominent, and lateral; gill-membrane with from three to ſeven rays; gill-cover of two pieces, rounded and ſtriated; body carinated each ſide, and covered with bony plates; dorſal fin ſingle, with diſtinct ſpines between it and the head; lateral line ſtraight; ventral fins behind the pectoral, and above the ſternum.

This is the Gmelinian character of the gaſteroſteus genus, and which, according to Lacepede, may be with propriety reduced to the following eſſential particulars; one dorſal fin with an armament of diſtinct dorſal ſpines placed before it; a longitudinal keel on each ſide the tail; one, two, or more rays in each thoracic fin, which are always ſpinous. The fiſhes of this genus are in general of a diminutive ſize, and, with the exception of four ſpecies, are peculiar to the ſeas and rivers of extra-European climates.

Species.

Aculeatus. Three ſpines on the back. Linn. *Stickling*, *Stachelfiſch*, Wulff. *Three-ſpined ſtickleback*, Donov. Brit. Fiſhes.

The length of this ſpecies rarely exceeds three inches; the head is rather compreſſed, and the eyes remarkably prominent; the ſides covered with a ſeries of hard bony plates as in the other ſpecies of the ſame genus; near the tail the body is ſquare, and beneath the vent is a ſhort ſpine. The colour of the back green; ſides, and beneath ſilvery; and the chin, with the breaſt, and fore part of the abdomen of the female, of a fine red colour when in full roe. It inhabits freſh waters in dykes, ditches, and little rivulets, and occurs in ſuch vaſt abundance in many parts of Europe, that, notwithſtanding the diminutiveneſs of the ſize, it is employed very often as an article of manure. Gmelin relates that the ſtickleback is frequently uſed to fatten ducks and pigs; and it is well known that in the neighbourhood of Dantzic a kind of oil is expreſſed from it, which is in frequent uſe for burning in lamps and other ſimilar purpoſes.

Ductor. Dorſal ſpines four; gill-membrane with ſeven rays. Gmel.

Inhabits the ocean, and always precedes, or appears in company, with the ſhark. The dorſal fin contains twenty-ſeven rays; pectoral eighteen; ventral ſix; anal ſixteen; and tail nineteen.

Japonicus. Dorſal ſpines four; gill-membrane with five rays. Gmel.

Length five inches, and of a yellow colour; the head obtuſe; jaws rough, without teeth; gill-covers not ſcaly, toothed behind; dorſal ſpines moveable, thick, ſtrong, unequal, and placed in a cavity; ventral fins connected by a thick rigid ſpine, an inch and a half in length; and the body covered with large rhombic ſcales, ending in ſpines turned backwards; the anterior part ciliated. with ſpines, and the edge brown. Inhabits Japan.

In the dorſal fin are ten rays; pectoral twelve; anal nine, and tail twenty-two.

Lyfan. Dorſal ſpines ſeven; anal two; gill-membrane eight-rayed. Gmel.

An Arabian ſpecies; the body above blueiſh-brown, beneath white, and of an oblong lanceolate form. The lateral line undulated on the anterior part. The dorſal fin includes one ſpinous, and twenty-one ſoft rays; pectoral, ſeventeen rays; ventral, one ſpinous and ſix ſoft rays, and the anal, one ſpinous and nineteen ſoft rays.

5

Occidentalis. Dorſal ſpines ſeven; and two before the anal fin. Gmel.

Native of America; colour ſilvery; tail longitudinally ſtriated.

Ovatus. Dorſal ſpines ſeven, the firſt recumbent; anal two. Gmel.

A ſpecies of ambiguous character, allied in ſhape, according to Gmelin, to the genus Chætodon, and in other reſpects not ſufficiently diſtinguiſhed from the Labrus or the Scomber, with the firſt of which it accords, in being deſtitute of the thoracic plate, and with the other in its recumbent dorſal ſpine. The jaws and lips are rough; the dorſal ſpines directed alternately to the ſides, the firſt very ſmall, the next rather longer. This fiſh inhabits Aſia.

Carolinus. Dorſal ſpines eight; anal three. Gmel.

Native of the ſeas of Carolina, and greatly allied to the genus Scomber; the body is of an oval form, inclining to oblong; lateral line ſub-carinated at the tail; dorſal and anal fins falcated; and tail nearly bilobate.

Canadus. Dorſal ſpines eight; anal none; gill-membrane ſeven-rayed. Gmel.

Body oblong; poſterior and anal fin falcate; tail nearly bilobate. Inhabits Carolina.

Saltatrix. Dorſal ſpines eight, connected by a membrane; gill-membrane with ſeven rays. Gmel.

Native of the ſeas of Carolina, where, from its ſkipping frequently out of the water, it is known by the name of Skip-jack. The lower jaw has a ſingle row of teeth, the upper two; the dorſal ſpines are weak, and placed in a cavity; the tail forked.

Pungitius. Dorſal ſpines about ten; and the ſides deſtitute of plates. *Spinis dorſalibus ſub-decem, lateribus abſque ſcutis*, Donov. *Gaſteroſteus pungitius; ſpinis dorſalibus decem*, Linn. *Centriſcus ſpinis decem*, &c. Klein. *Spinarella puſillus*, Bell. *La petite épinoche de mer*, Bloch. *Leſſer ſtickleback*, Will. *Ten-ſpined ſtickleback*, Penn.

The leſſer or ten-ſpined ſtickleback is the moſt diminutive of the fiſh tribe known, very rarely exceeding, when full grown, an inch and a half in length, and is even ſeldom found of that ſize.

This ſpecies is of a rather more ſlender ſhape than the common kind, and the jaws a little longer in proportion; the colour on the back olive; ſides yellowiſh, and parts beneath ſilvery. The number of the dorſal ſpines, which Linnæus and Gmelin admit as the principal diſtinction of the ſeveral ſpecies in this genus, we may venture to aſſert, ſo far as relates to the preſent ſpecies, at leaſt is not always conſtant. We have ſeen it with ten dorſal ſpines, as thoſe authors deſcribe; we have alſo ſeen it with only nine, and one example with no more than eight. Theſe circumſtances ſeem ſufficient to juſtify the ſlight amendment in the ſpecific character above propoſed, to which may be added, that the abſence of the lateral plates is very characteriſtic, and at once removes this from the other Britiſh ſpecies. The pectoral fin uſually contains about ten rays; the anal fin nine; and the tail twelve.

Spinachia. Dorſal ſpines fifteen. Linn. *Gaſteroſteus pentagonus*, Klein. *Aculeatus vel pungitius marinus longus*, Ray. *Grand épinoche*, Bloch. *Fifteen-ſpined ſtickleback*, Donov. Brit. Fiſhes.

Length from ſix to eight inches. The head of a remarkable tubular form; the body ſlender; back armed with fifteen ſharp ſpines, and the lateral line compoſed of ſmall, ſomewhat prominent, and pointed ſcales. General colour above olive, variable, and tinged with gold, beneath white. The dorſal fin contains about ſeven rays; pectoral fin ten rays; ventral an acute bony proceſs; in the anal fin are eight rays,

rays, the firſt of which is ſhort and ſpinous; and the tail contains twelve rays.

Inhabits the ſeas of Europe, and is rarely, if ever, found in freſh waters. The food of this ſpecies conſiſts of the fry of fiſhes and worms. It is taken in great plenty in ſome parts of Europe, not as an article of food, for it is ſeldom eaten; but, like the common freſh-water ſtickleback, for the purpoſe of manure, and alſo for the ſake of the oil, which it yields in abundance.

Spinarella. Spines on the poſterior part of the head four, ſomewhat ſerrated; the lateral ones as long as the belly. Gmel.

A native of India.

Acanthias. Four ſmall rays before the dorſal fin; gill-membrane three-rayed. Gmel.

Inhabits the ſeas of Denmark.

GASTOLDI, ſometimes called *Gaſtaldi*, in *Biography*, a voluminous muſical Italian compoſer, born at Caravaggio, was author of thirty different works; the titles and dates of which may be ſeen in Draudius and Walther. Of theſe we have only ſeen his ballads, printed at Antwerp, 1596, under the following title: "Balletti a 5. co i verſi per cantare, ſonare, e ballare; con una Maſcherata de Cacciatori à 6. e un Concerto de' Paſtori, à 8." This puts the derivation of our word ballad out of all doubt, which originally meant a ſong that was ſung and danced at the ſame time. The tunes of Gaſtoldi are all very lively, and more graceful than any we have ſeen before the cultivation of melody for the ſtage. The firſt edition of theſe ballads was publiſhed at Venice, 1591; many of them are called *Fa las*, under which title our Morley, four years after, publiſhed ſhort airs, in five parts: ſo that it ſeems as if the name of *Fa la*, ſilly as it is, was not originally Engliſh.

GASTON de Foix, duke of Nemours, and nephew of Lewis XII. king of France, was born in 1488. The monarch took delight in the education of the youth, and at a proper period beſtowed upon him the government of Milan, and made him general of his army in Italy. The youthful hero was equally deſirous of ſhewing proofs of his valour, and ſignalized himſelf in various actions, the laſt of which was the battle of Ravenna, fought on Eaſter Sunday, 1512. Not contented with a ſignal victory he reſolved to follow the retreating army, and making a furious charge he was thrown from his horſe, and killed by an enemy's pike. His death, which happened in his 24th year, more than overbalanced the joy ariſing from the ſucceſs. Moreri.

GASTONIA, in *Botany*, ſo named by Commerſon and Juſſieu, in honour of Gaſton duke of Orleans, the ſecond ſon of Henry IV. of France. He was the patron of Moriſon, and founded the botanic garden at Blois, known to botaniſts by the name of *hortus bleſenſis*, of which Moriſon publiſhed a catalogue. This prince formed a plan for a general collection of drawings of plants, which was regularly continued after his death by the kings of France up to the revolution, and is ſtill we believe in a progreſſive ſtate, conſtituting one great ornament of the national library.—Juſſ. 217. Lamarck. Dict. v. 2. 610. Claſs and order, *Dodecandria Dodecagynia*. Nat. Ord. *Hederaceæ*, Linn. *Araliæ*, Juſſ.

Gen. Ch. *Cal.* Perianth ſuperior, of one leaf, ſhort, entire, ſlightly waved. *Cor.* Petals ſix, rarely but five, broad at the baſe, ſeſſile, ſomewhat triangular, keeled, acute, ſpreading, recurved at the point. *Stam.* Filaments twelve, rarely but ten, ſhort, awl-ſhaped; anthers ſhorter than the corolla, oblong, furrowed, of two lobes. *Piſt.* Germen ovate, furrowed; ſtyles ten or twelve, ſmall and ſhort; ſtigmas ſimple. *Peric.* Capſule? or berry? ovate, with ten or twelve furrows and as many cells, crowned with the permanent calyx. *Seeds* ſolitary.

Eſſ. Ch. Calyx of one leaf, ſuperior, entire. Petals ſix, broad at the baſe. Fruit of twelve cells. Seeds ſolitary.

This genus is akin to *Aralia*, as well as to Forſter's *Polyſcias*, Nov. Gen. t. 32, but differs widely from both in its calyx, as well as with reſpect to number in the parts of fructification. It was found by Commerſon on a large umbelliferous tree of the iſle de Bourbon, called in that country *bois d'eponge*, from its ſpongy bark, and hence Lamarck gives it the awkward ſpecific name of *cutiſpongia*. The *leaves* are pinnate, with a terminal leaflet often wanting; leaflets two or three inches long, ovate, wavy, entire, coriaceous, ſmooth. *Umbels* of about eight flowers, very numerous, in branched or umbellate cluſters, all naked. *Flowers* greeniſh, with yellow anthers, larger than in moſt umbelliferous plants, all equal and regular. Juſſieu ſays that on old trees they have five petals and fifteen ſtamens; on younger ones ten petals and ten ſtamens. We are indebted to him for a ſpecimen. Lamarck ſeems to have omitted this genus in his plates. This writer conſiders the *Nalugu*, Rheede Hort. Mal. v. 2. 43. t. 26, as another ſpecies, which Linnæus quotes for his *Aralia chinenſis*, and Juſſieu is diſpoſed to refer to *Aquilicia*, that is, *Leea*.

GASTORF, in *Geography*, a town of Bohemia, in the circle of Leitmeritz; 8 miles S.E. of Leitmeritz.

GASTOUNI, a town of European Turkey, in the Morea; 12 miles E. of Chiarenza.

GASTREL, Francis, in *Biography*, was born at Slapton, in Northamptonſhire, about the year 1662. He was educated at Weſtminſter under the celebrated Dr. Buſby, where he was admitted a king's ſcholar, and afterwards elected ſtudent of Chriſt-church college, Oxford. This was in the year 1680; in 1684 and 1687 he took his degrees of B.A. and M.A., and in a ſhort time he was admitted to orders, and became diſtinguiſhed as a preacher. In 1694 he was appointed preacher to the honourable ſociety of Lincoln's Inn, London, and in 1697 he was appointed to preach the lecture founded by the Hon. Robert Boyle. The diſcourſes delivered on this occaſion he publiſhed in a continued treatiſe, entitled "The certainty and neceſſity of Religion, or the firſt Grounds and Principles of human Duty eſtabliſhed." In the year 1699 he publiſhed another diſcourſe as a ſecond part of the ſame important ſubject, entitled "The chriſtian Revelation, and the neceſſity of believing it eſtabliſhed, in oppoſition to all cavils and inſinuations of ſuch as pretend to allow natural religion and reject the Goſpel." In 1700 Mr. Gaſtrel took his degree of doctor in divinity, and was appointed chaplain to the houſe of commons. Two years afterwards he was preſented by the queen to a canonry of Chriſt-church in Oxford. About this time he engaged in the controverſy on the Trinity, and publiſhed "Some conſiderations concerning the Trinity, and the way of managing that controverſy," which was ſo well received that it quickly paſſed through two editions, and in the third he ſubjoined a vindication of it in reply to ſome animadverſions of Mr. Anthony Collins in his "Eſſay concerning the uſe of Reaſon." In 1707 he publiſhed "The Chriſtian Inſtitutes, &c. collected out of the writings of the Old and New Teſtament." In the year 1711 Dr. Gaſtrel was choſen proctor in convocation, for the chapter of Oxford, and was appointed one of the queen's chaplains. In 1714 he publiſhed his "Remarks upon Dr. Clarke's Scripture Doctrine of the Trinity," and in the ſame year he was promoted to the biſhopric of Cheſter, which occaſioned the reſignation of his office as preacher at Lincoln's Inn, though he was ſtill permitted to hold the canonry of Chriſt-church in commen-

dam. In politics Dr. Gaſtrel ſided with the Tories, which led to his promotion in the reign of queen Anne, but rendered him in ſome degree obnoxious to the adminiſtration in the following reign, whoſe meaſures he oppoſed in the houſe of lords. He ſhewed his zeal for the univerſity of Oxford in 1717, when it was attacked in the houſe of lords, upon account of a riot, or pretended riot, on the prince of Wales's birth-day. When the bill was depending againſt his old friend the biſhop of Rocheſter, he ſpoke with animation in his behalf, and with indignation againſt the adminiſtration. And in the year 1723, when the bill for inflicting pains and penalties on the biſhop had paſſed the commons, and was brought into the houſe of lords, Dr. Gaſtrel oppoſed it in every ſtage, becauſe he was convinced that there was not ſufficient evidence to juſtify the violence of the proceedings inſtituted againſt Dr. Atterbury. Dr. Gaſtrel fell a victim to the gout in the year 1725, when he was about ſixty-three years of age. He died at his apartments in Chriſt-church, and was buried in the cathedral there, without any monument. "But," ſays the writer of his life in the Biographia Britannica, "he left a ſufficient monument of himſelf in his excellent writings." Beſides his other employments, he was one of the commiſſioners for building fifty new churches in London: and a member of the Society for propagating the Goſpel in foreign Parts. Biog. Brit.

GASTRIC, in *Anatomy*, an adjective derived from γαςηρ, the ſtomach, and applied to the arteries, nerves, or other parts belonging to that organ.

GASTRICUS Succus, or *Gaſtric juice*, in *Phyſiology*, an animal fluid, ſecreted in the ſtomach, mixed with the food, which it has the power of diſſolving, and conſtituting thereby the chief agent in the proceſs of digeſtion. See DIGESTION.

GASTRILOQUUS, or GASTRILOQUOUS, a perſon who ſpeaks inwardly, or within his ſtomach, and whoſe voice ſeems to come from afar off; more uſually called *ventriloquus*, which ſee.

The term is formed of the Greek, γαςηρ, *belly*, *ſtomach*, and the Latin, *loqui*, *to ſpeak*.

GASTRITIS, in *Medicine*, from the Greek, γαςηρ, the *ſtomach*, with the termination *itis*, ſignifies inflammation of the ſtomach.

From the variety of ſubſtances which paſs through the ſtomach, and which may be injurious either by their quality or quantity, and from its great ſympathy with the reſt of the body, it might be expected that this organ would be particularly liable to be affected with inflammation. Such an affection, however, at leaſt in the acute form, generally underſtood by the appellation of gaſtritis, is a rare occurrence. But it has been obſerved by Dr. Cullen, that a leſs active degree, or rather a peculiar modification of the diſeaſe, which he has termed the *erythematic* inflammation of the ſtomach, occurs more frequently; although the ſymptoms, by which its preſence is indicated, are not always ſo unequivocal as thoſe of the acute or phlegmonous inflammation. The two forms of the diſeaſe have their ſeat, he conceived, in different parts of the ſtructure; the acute gaſtritis affecting the nervous coat of the ſtomach, or the peritoneum inveſting it; while the erythematous inflammation is always ſeated in the villous coat and cellular texture immediately ſubjacent.

The phlegmonic inflammation of the ſtomach, or gaſtritis properly ſo called, is characterized by an acute burning pain in the region of the ſtomach, which is ſuddenly increaſed, and vomiting at the ſame time excited by any thing whatever that is ſwallowed; it is alſo aggravated by external preſſure. Theſe ſymptoms are accompanied by a great degree of general fever or pyrexia; the pulſe is extremely quick and ſmall, and commonly hard. There is alſo extreme anxiety, and a greater depreſſion of ſtrength and loſs of power in all the functions of the body, than in the caſe of almoſt any other inflammation. In many inſtances there is a remarkable tendency to ſyncope; and there is frequent reaching, and often hiccup, independently of any thing ſwallowed. In ſome inſtances, other ſymptoms are ſuperadded to theſe. Thus very early in the diſeaſe, a high delirium has ſometimes come on, with great giddineſs and loſs of ſight, from the ſympathetic affection of the brain; conſiderable difficulty of breathing has alſo occurred, probably from the impoſſibility of depreſſing the diaphragm without compreſſing the ſtomach; convulſions of the muſcles, and in ſome caſes, although intenſe thirſt was preſent, an actual hydrophobia, or horror of taking liquids, has alſo taken place. By this term is to be underſtood, however, only a dread of drinking, and not the *rabies canina*, improperly called hydrophobia, from *one* of its ſymptoms. In a remarkable caſe of inflammation of the ſtomach, (deſcribed in the Edinburgh Medical Eſſays, vol. i. art. 29.) which was moſt violent, but ultimately cured by repeated blood-letting, this dread of liquids obviouſly aroſe from experience of the acute pain excited in the gullet and throat. "After this laſt blooding," ſays the writer, "the patient, finding himſelf more than ever relieved, called haſtily for a little warm milk and water, which he greedily glutted in a mouthful, and that very moment, with great force, ſpouted it at a great diſtance, and after it an incredible quantity of ſaliva in the ſame manner, telling, that notwithſtanding all his burning thirſt, to ſwallow it was impoſſible; nor could he, without a kind of horror, hear of any drink." Hence, it has been ſuppoſed, that the dread of water, connected with canine madneſs, originates from an inflammation of the gullet and ſtomach, more particularly as diſſection has often diſcovered a ſmall degree of ſuch inflammation in that diſeaſe. See HYDROPHOBIA.

From the great ſenſibility of the ſtomach, and its ſympathetic connection with the other important organs of life, it muſt be obvious that inflammation of this viſcus, by whatever cauſes produced, muſt occaſion a great and often fatal derangement of the ſyſtem. In particular, by the great debility which ſuch an inflammation ſuddenly induces, it may quickly prove fatal, without running the common courſe of inflammations. Such indeed is the connection of the ſtomach with life, that ſome of the cauſes of gaſtritis produce death almoſt inſtantaneouſly, before any inflammation can be excited. Thus ſome of the narcotic poiſons, ſuch as laurel-water, a ſtrong infuſion of tobacco, or even ſpirituous liquors in ſufficient quantity, have produced immediate death; a large draught of cold water, after the body has been violently heated and exhauſted by great exertions and copious ſweating, has likewiſe had the ſame effect. (See COLD.) And a blow on the region of the ſtomach will occaſion inſtant death without producing either inflammation or rupture of veſſels; as in the caſe of a man taken to the Royal Infirmary at Edinburgh, and mentioned by Dr. Gregory in his lectures.

If the diſeaſe laſts long enough to follow the ordinary courſe of other inflammations, it may terminate like them by reſolution, gangrene, or ſuppuration. Some writers have mentioned ſcirrhus and cancer of the ſtomach as among the ſequelæ of gaſtritis; but Dr. Cullen has correctly ſtated that the ſcirrhoſities, which are often diſcovered affecting the ſtomach, are ſeldom known to be the conſequences of inflammation. The *prognoſis*, as to the tendency of the diſeaſe to one or other of theſe terminations, may be deduced from the following appearances and conſiderations. The diſpoſition of the inflammation to ceaſe, or to terminate by *reſolution*, as it is called, may be known by its having ariſen from no

no violent caufe, which may have injured the texture or fubftance of the ftomach; by the mild or moderate ftate of the fymptoms; and by a gradual remiffion of them, in confequence of the action of the remedies employed in the courfe of the firft few days of the difeafe. For in violent cafes, where the remedies have not been applied fufficiently early or with fufficient vigour, gangrene comes on very rapidly. The tendency to *gangrene* may be fufpected from the unyielding obftinacy of the fymptoms, when active remedies have been early employed, and efpecially when the inflammation has been induced by corrofive poifons, or draftic emetics, taken into the ftomach. And that a gangrene has already begun, may be known from the fudden remiffion or ceffation of the pain, while the pulfe continues frequent, and at the fame time becomes weaker; while other marks of the finking of the powers of life in the whole fyftem come on; fuch as frequent fainting, ftarting of the tendons, hiccup, a cadaverous appearance of the countenance, &c. *Suppuration* is a lefs frequent termination of gaftritis, but occafionally occurs, and may be expected to take place, when the fymptoms have continued, in a moderate degree, for more than one or two weeks; and efpecially when there is a confiderable remiffion of the pain, while a fenfe of weight and anxiety ftill remain. When an abfcefs is formed, the frequency of the pulfe is at firft abated; but it foon again increafes, and frequent cold fhiverings, and marked exacerbations of heat and feverifhnefs in the afternoon and evening, followed by night-fweats, come on; in other words, a hectic fever enfues. At length the difeafe commonly proves fatal, unlefs the abfcefs open into the cavity of the ftomach, the pus be difcharged by vomiting, and the ulcer foon heal. There are, indeed, fome rare inftances on record, in which the impofthume has burft externally, and not only the pus, but the alimentary matters fwallowed, have paffed out at the opening during the remainder of life. In fuch cafes, a previous adhefion of the ftomach with the peritoneum had taken place by means of the inflammatory procefs. Van Swieten mentions a woman of 60 years of age, whom he vifited, and who had fuftained fuch a fiftulous opening for 12 years, without any great injury to her health; "and I obferved," he adds, "that the contents of the ftomach came out in part through the opening of this fiftula." (Comment. ad Aph. 955, Boerhaav.) He refers to a ftill more extraordinary cafe, related in the Journal des Savans, for 1737, which occurred in a girl, in whom a fuitable comprefs and bandage were required to clofe the large opening of the fiftula, otherwife all the nourifhment that was taken in immediately flowed out through it. Neverthelefs, the opening of this ulcer gradually contracted itfelf, and fhe lived in fuch good ftrength as to undergo the labours in a country farm; in which manner fhe fupported her malady for the fpace of 23 years.

Caufes of Gaftritis.—We are not acquainted with any particular *predifpofition* to gaftritis in the firft inftance; but when the difeafe has once occurred, like moft other inflammations, it leaves a tendency in the part affected to be more eafily excited to inflammation again; and therefore, for a long time fubfequent to recovery, the utmoft caution, in regard to the ufe of irritating food and drink, is required. The *exciting* caufes are fuch matters applied to the ftomach, as from their fenfible, chemical, or mechanical properties, occafion violent irritation to the ftomach, or injure its texture: or the inflammation is produced by the extenfion of the difeafe from the neighbouring organs, or from diftant parts by what has been termed *metaftafis*. Among the firft of thefe, are, large draughts of cold liquids, taken while the body is greatly heated, the perfpiration is profufe, and the exertions which occafioned the heat have been remitted;—over-diftenfion of the ftomach with highly ftimulant or indigeftible food;—chemical acrids, whether poifons, properly fo called, or draftic antimonial, mercurial, or cupreous emetics, taken into the ftomach;—mechanical matters, which by their weight, roughnefs, &c. mechanically injure the coats of the ftomach;—and in fome cafes of peculiar debility of the ftomach, even fermented liquors, or ordinary food. Among the laft-mentioned caufes are the inflammation of other vifcera, as of the liver, bowels, &c.;—the transference of gouty, rheumatic, or eryfipelatous inflammation, from the extremities;—and the checking of certain chronic eruptions on the fkin. The ftomach is alfo liable to be inflamed under an attack of general fever, like other organs of the body, by particular determinations of the circulation to the part. See FEVER.

Appearances on Diffection.—When inflammation of the ftomach induces death, independently of fuppuration or gangrene (which are not the moft frequent terminations of the difeafe), fometimes the inflammation is found, upon diffection, to have fpread over a confiderable part, or perhaps the whole, of the inner membrane; but moft commonly it occupies a fmaller portion. The ftomach upon the outfide, at the inflamed part, fhews a greater number of fmall veffels than ufual, but is commonly not much crowded with them. On opening the ftomach, it is found to be a little thicker at the inflamed part, the inner membrane is very red from the number of fmall florid veffels, and there are frequently fpots of extravafated blood. When the exciting caufe has been a corrofive poifon, fuch as arfenic, for inftance, the inflammation is moft intenfe. The fubftance of the ftomach is then found thickened, and on opening into its cavity there is a very great degree of rednefs in the inner membrane, arifing partly from the very great number of minute veffels, and partly from extravafated blood. Portions of the inner membrane are fometimes deftroyed, from the violent action that has taken place in confequence of the immediate application of the poifon: and fometimes a thin layer of coagulable lymph is found thrown out upon a portion of the inner furface of the ftomach. (See Baillie, Morbid Anat. p. 138.) It muft be added, however, that from the diffection of dead bodies it is known that the ftomach has been often affected with inflammation when the characteriftic fymptoms, before mentioned, had not appeared: of this we fhall have occafion to fpeak prefently.

Cure of Gaftritis.—The treatment of inflammation of the ftomach will neceffarily vary according to the nature of the exciting caufe, and to the degree and duration of the difeafe, and to the circumftance of its being fimple or complicated. The leading indication, however, and the general plan muft be the fame as in all phlegmonic inflammations, in their commencement, namely, to attempt the refolution of the difeafe by depletion, together with the ftrict obfervance of the antiphlogiftic regimen. Large bleedings muft be fpeedily employed, and repeated, if the urgency of the fymptoms continue to require it, notwithftanding the fmallnefs of the pulfe, the general debility, and even difpofition to fainting. For, after bleeding, it is obferved that the pulfe commonly becomes fuller, and the tendency to fyncope is diminifhed. In the inftance, recorded in the Edinburgh Medical Effays, to which we have already alluded, the patient was bled five times within feven hours, and was each time fuddenly relieved from the acute pain; the pulfe, before irregular, became regular; and the cold extremities became warm. In delicate conftitutions, when the violence of the inflammation has been reduced, but not altogether removed, by bleeding, the application of leeches, or of cupping-glaffes, after fcarification,

cation, to the region of the ftomach, may be occafionally reforted to with advantage. A large blifter, applied to the pit of the ftomach, after venefection, is likewife advantageous. In cafes where a confiderable irritability of the ftomach, with little or no actual inflammation, exifts, and gives rife to naufea and vomiting, the external agency of a blifter is often the moft effectual remedy. The refolution of the inflammation is alfo affifted by fomentations to the whole of the abdomen, or by frequent emollient and laxative glyfters, which will contribute alfo to the purpofe of dilution, and, from the vicinity of the colon to the ftomach, may act as a fort of internal fomentation.

It is fortunate that thefe meafures, particularly the bloodletting and bliftering, conftitute the moft effective means that we poffefs of reducing inflammatory action; for as, in this inflammation, every thing applied to the internal furface of the ftomach itfelf is immediately rejected, and adds to the morbid irritation; no medicine can be adminiftered by the mouth for its cure; and it is perhaps advifable to abftain altogether from taking any thing whatever into the ftomach, whether by way of medicine or aliment, until the violence of the inflammation be fomewhat fubdued, however contrary fuch abftinence may be to the prejudices of Englifhmen. An exception to this, however, lies in the cafe of gaftritis, occafioned by acrid or poifonous fubftances; for here diluent liquids muft be given, and the vomiting produced, by removing the irritating caufe, may be ferviceable; although it muft be recollected that thefe acrid matters commonly produce a fufficient degree of vomiting themfelves. In other cafes, where any thing can be borne by the ftomach, liquids of the very mildeft kind, fuch as milk and water, thin gruel, &c. muft be given, and in very fmall quantities at a time.

For the acrid mineral poifons, which act *chemically* on the living fibre, the ufe of antidotes or *correctors* naturally fuggefts itfelf. Thus the undiluted and corrofive acids and alkalies may be reciprocally neutralized by each other; the fulphurets have been fuppofed to correct the acrid qualities of arfenical falts, &c. (See ARSENIC.) But it muft be obferved, with refpect to the undiluted acids, and the pure or cauftic alkalies, that their injurious operation on the texture of the parts with which they come in contact is inftantaneous, and before any remedies can be applied, the whole mifchief is accomplifhed.

Opiates, in whatever manner exhibited, are very hurtful during the firft days of inflammation of the ftomach; but when its violence has greatly abated, or the pain and ficknefs recur at intervals only, opiates may be cautioufly adminiftered in glyfters, and have fometimes been thus employed with advantage.

The antiphlogiftic regimen muft be in a confiderable degree adhered to, even after the difeafe is fubdued: a low mild diet muft be continued for fome weeks; the food being fparing alfo in quantity, confifting of milk and vegetables chiefly, and every thing hard, vifcid, infoluble, or ftimulant, together with all fermented liquors, being carefully avoided. We formerly mentioned, and the obfervation was fupported by the authority of Dr. George Fordyce, that one of the moft common caufes of relapfe in fevers was the too fpeedy recurrence to the ordinary full diet. (See FEVER.) This obfervation is ftill more applicable to the *phlegmafiæ*, or acute inflammations, and above all to inflammation of the ftomach; becaufe infoluble or ftimulating fubftances not only operate by their influence on the general fyftem, but by their immediate contact with the organ, which is debilitated, and predifpofed to difeafe by the previous fuffering.

When *fuppuration* has actually begun, as Dr. Cullen juftly remarks, it muft be left to nature; our medicines are of no avail in influencing its progrefs, and the bufinefs of the phyfician is only to *avoid* all irritation. We can only confine the patient to quietnefs, and a mild diet. The cafe is then almoft hopelefs.

With refpect to the *erythematic* inflammation of the ftomach, it was confidered by Dr. Cullen as a more frequent occurrence than that of the *phlegmonic* kind. We have already ftated that diffection has fometimes detected the prefence of an inflamed condition of the ftomach, when neither pain nor pyrexia had before given any notice of it. Such inflammation Dr. Cullen apprehends to have been chiefly of the erythematic kind. This fpecies of inflammation, he thinks, would more frequently occur, from acrid matter of any kind taken into the ftomach, were not the interior furface of this organ commonly defended by mucus, exuding in large quantity from the numerous follicles placed immediately under the villous coat. Upon many occafions, however, the exudation of mucus is prevented, or the liquid poured out is of a lefs vifcid kind, fo as to be lefs fitted to defend the fubjacent nerves; and, in fuch cafes, matters even of moderate acrimony may produce an erythematic affection of the ftomach.

But although it fometimes occurs where neither pyrexia, pain, nor vomiting indicate its prefence, there are cafes in which it may be difcovered. The affection of the ftomach fometimes fpreads into the œfophagus, and appears in the pharynx, as well as on the whole internal furface of the mouth. When, therefore, an erythematic inflammation affects the mouth and fauces, and when at the fame time there fhall be in the ftomach an unufual fenfibility to all acrids, with a frequent vomiting, there can be little doubt of the ftomach being affected with the fame inflammation that has appeared in the fauces. Even when no inflammation appears in the throat, yet if fome degree of pain be felt in the ftomach, if there be a want of appetite, an anxiety, frequent vomiting, an unufual fenfibility with refpect to acrids, fome thirft, and frequency of pulfe, there will then be room to fufpect an erythematic inflammation of the ftomach; and Dr. Cullen affirms that he has known fuch fymptoms, after fome time, difcover their caufe more clearly by the appearance of the inflammation in the fauces or mouth. Erythematic inflammation is often difpofed to fpread from one place to another on the fame furface; and, in doing fo, to leave the place it had at firft occupied. Thus, fuch an inflammation has been known to fpread fucceffively along the whole courfe of the alimentary canal, occafioning in the inteftines diarrhœa, and in the ftomach vomitings; the diarrhœa ceafing when the vomitings came on, or the vomitings upon the appearance of the diarrhœa.

When an erythematic inflammation of the ftomach is difcovered, it is to be treated differently according to the difference of its caufes and fymptoms. When it is owing to acrid matters taken in by the mouth, and when thefe may be fuppofed to be ftill prefent in the ftomach, they fhould be wafhed out by throwing in a large quantity of warm and mild liquids, and exciting vomiting. At the fame time, if the nature of the acrimony and its proper corrector be known, this fhould be thrown in; or if a fpecific corrector be not known, fome general demulcents fhould be employed, in order to invifcate the acrid matter, or to defend the furface of the ftomach from its irritation. Thefe meafures, however, are more fuitable to prevent the inflammation than to cure it after it has taken place. When it has occurred, and is attended with a fenfe of heat, with pain and fever, the modes of depletion, bliftering, and fomentations, mentioned when

ſpeaking of the phlegmonic gaſtritis, muſt be more or leſs employed according to the degree of thoſe ſymptoms. When an erythematic inflammation of the ſtomach has ariſen from internal cauſes, if pain and pyrexia accompany the diſeaſe, ſome bleeding, in perſons not otherwiſe weakened, may be employed; but as the affection often ariſes in what are called putrid diſeaſes, and in convaleſcents from fever; ſo in theſe caſes bleeding is inadmiſſible: all that can be done being to avoid irritation, and to throw into the ſtomach what quantity of acids, and of aceſcent aliments, it ſhall be found to bear. In ſome conditions of the body, in which this diſeaſe ariſes, the Peruvian bark and bitters may ſeem to be indicated; but an erythematic ſtate of the ſtomach does not commonly allow of them. See Cullen, Firſt Lines, chap. viii. Van Swieten Comment. Sauvages.

GASTROBRANCHUS Cœcus, in *Ichthyology*, is a curious fiſh, that has been erroneouſly ranked by Linnæus among the *Vermes*, under the name of Myxine *glutinoſa*. Its uſual length is from four to ſix or ſeven inches, and its general appearance is that of a ſmall eel; the mouth is ſituated beneath, as in the lamprey, and is of an oblong form, bearded on each ſide, and furniſhed with a series of teeth, diſpoſed on each ſide into a double row, in form of a pectinated bone. This animal is deſtitute of eyes. The accurate examination of its ſtructure by Dr. Bloch has proved it to belong to the tribe of cartilaginous fiſhes: the ſkin is ſmooth, and deſtitute of ſcales, and the animal is of an uncommonly glutinous nature. It is not unfrequently found about the Britiſh coaſts, and is ſaid to deſtroy other fiſhes by piercing their ſkin, and ſucking their juices, and even devouring all the internal parts.

GASTROCELE, (derived from γαςης, *the ſtomach*, and κηλη, *a tumor*,) a hernia, or rupture containing the ſtomach. See Hernia.

GASTROCNEMIUS, in *Anatomy*, from γαςης, the *belly*, and κνημη, the *leg*, is a muſcle of the leg, occupying the ſurface of the calf. The three muſcles compoſing the calf are ſo connected to each other, that they ought to be deſcribed together; moreover, their office is the ſame. We ſhall include them under this article. The gaſtrocnemius, which ariſes from the femur, and the ſoleus, originating from the tibia and fibula, are both connected to a common tendon, which projects at the lower and back part of the leg, and is inſerted into the back of the heel. This is called tendo Achillis, as being the part by which Thetis is ſaid to have held her ſon, when ſhe dipped him in the Styx.

The *gaſtrocnemius*, (called alſo gemellus, gaſtroc. externus, and bi-femoro-calcanien,) forms with the ſoleus the extenſor tarſi ſuralis or magnus of Douglas. It conſiſts of two portions, very much reſembling each other, ſeparate above, and uniting below in a common aponeuroſis, placed at the back of the leg, and extending from the femoral condyles to the poſterior ſurface of the os calcis. The internal head of the muſcle is larger than the external, flattened, and broader below than above. Its poſterior ſurface is covered above by the ſemi-membranoſus, and in the reſt of its extent by the faſcia of the leg. The anterior ſurface covers the knee joint, the attachment of the ſemi-membranoſus, the popliteal artery, the popliteus muſcle, the plantaris, and the ſoleus. Its inner edge is unattached: the outer is ſeparated from the external head at its upper half, and united with it by the lower. The upper extremity, which is thick and ſomewhat rounded, is attached juſt above the back part of the internal condyle. From this point it deſcends and paſſes with a ſlight obliquity from within outwards, ſoon joining the external head. Its breadth increaſes gradually to about the middle of the calf, and then diminiſhes again, ending in a broad aponeuroſis. The internal head is covered behind by the aponeuroſis of the leg: it covers in front the capſule of the knee, the popliteus and ſoleus. The outer margin is unattached, while the inner is ſeparated from the oppoſite above, and confuſed with it below. Its upper extremity is attached juſt above the back of the external condyle. It deſcends at firſt rather obliquely from without inwards, grows broader firſt, then again narrower, and ends in the ſame aponeuroſis as the former head. Both theſe portions of muſcle terminate below the middle of the leg in a broad and flat tendon, which grows narrower as it deſcends. This is attached to the poſterior ſurface of the ſoleus ſooner on the outer than on the inner ſide, and is very intimately connected to that muſcle.

The two heads above deſcribed are tendinous and muſcular. The internal is fixed to the former by a broad and thick tendon, intimately connected in front to the capſule of the knee, deſcending firſt on the inner edge, and then expanding into a broad ſheet, which covers more than the upper half of the poſterior ſurface. The tendon of the outer head is not ſo thick as that of the preceding. After deſcending for two inches on the outer edge, it expands on the back of the muſcle, like the former. The common aponeuroſis, in which the two heads terminate, increaſes very much in breadth as it aſcends, and covers the anterior ſurface almoſt as high as the upper extremities. The fleſhy fibres of the inner head ariſe from the outer edge and anterior ſurface of its upper tendon, and terminate on the back of the common aponeuroſis. Thoſe of the outer paſs, in like manner, from the inner edge and front of the upper tendon to the back of the common expanſion, but are not mixed with thoſe of the oppoſite head.

The *plantaris*, extenſor tarſi minor of Douglas, jambier grêle, petit femoro-calcanien, is a very long but ſlender muſcle, placed between the gaſtrocnemius and ſoleus, and not exiſting in all ſubjects. It extends from the back of the outer femoral condyle, to the poſterior and inner part of the os calcis. Its poſterior ſurface is covered by the gaſtrocnemius; it covers in front the capſule of the knee, the popliteus, the popliteal artery, and the ſoleus. Its upper extremity is fixed to the upper and back part of the external condyle of the femur, to the capſule of the knee, and to the tendon of the outer head of the gaſtrocnemius. It deſcends obliquely from without inwards, and, after a courſe of three inches and a half, forms a very narrow flat tendon, which continues between the gaſtrocnemius and ſoleus, until the lower fourth part of the leg, when it eſcapes. It is then connected to the inner edge of the tendo Achillis, and deſcends with that tendon, being ſtill more intimately united to it below, where it is implanted in the upper, inner, and back part of the os calcis.

The ſoleus, gaſtrocnemius internus, le ſoleaire, tibio-peroneo-calcanien, is placed at the back of the leg, and extends from the upper extremity of the fibula to the poſterior portion of the os calcis. It is broad and thick, and nearly oval, and preſents to our conſideration an anterior and poſterior ſurface, an inner and outer edge, an upper and lower extremity. The poſterior ſurface is covered by the gaſtrocnemius and plantaris, and below the former by the faſcia of the leg: the front ſurface covers the peroneus longus, the upper third part of the back of the fibula, to which it is attached, the popliteus, flexor longus digitorum pedis, flexor longus pollicis pedis, and tibialis poſticus, the popliteal, poſterior tibial, and peroneal arteries, and the poſterior tibial nerve. The inner margin is ſeparated above from the popliteus by an interval, in which the popliteal artery and accompanying nerve paſs: it is then fixed to the oblique line at the upper and back part of the tibia, and to the inner margin

margin of the bone, half way down the leg. In the reſt of its extent it is unattached. The external margin is unconnected throughout, and offers nothing worthy of remark. The upper extremity of the muſcle is thin and narrow, and fixed to the upper and back part of the fibula. From this point it deſcends along the back of the leg, growing broader to the middle of the limb, and then contracting again to the inferior extremity, which is fixed to the lower and back part of the os calcis.

The ſtructure of the ſoleus is tendinous, aponeurotic, and fleſhy. Its attachment to the os calcis is by means of a very powerful tendon, named tendo Achillis, which is fixed to the lower half of the poſterior ſurface of the bone. The anterior ſurface of the tendon is in contact with the upper half of the back ſurface of the bone, which is covered by a layer of cartilage. A thin ſynovial membrane expanded over the oppoſed ſurfaces renders them ſmooth, and confines the ſynovia, by which they are lubricated. As the tendon aſcends from the heel, it is at firſt contracted ſlightly in its breadth, ſo as to aſſume nearly a cylindrical figure: it then grows broader, and divides into two aponeuroſes, a ſmaller belonging, as we have already deſcribed, to the gaſtrocnemius, a much more conſiderable one to the ſoleus. The latter grows broader as it aſcends, and expands ſo as to cover the whole poſterior ſurface of the muſcle, excepting the upper extremity.

From its anterior ſurface, near the outer margin, there ariſes an aponeurotic ſeptum, which aſcends among the muſcular fibres, and approaches gradually to the middle of the muſcle. Two other aponeuroſes, an internal and an external one, may be obſerved towards the upper part of the front of the ſoleus. The firſt ariſes from the oblique line at the back of the tibia, and from its inner edge, and deſcends on the inner ſide of the front of the muſcle below its middle. The latter proceeds from the upper extremity and outer margin of the fibula, and deſcends low on the outer part of the muſcle. From its upper and inner edge a portion is detached, to form an aponeurotic inverted arch, covering the paſſage of the popliteal veſſels and nerve behind, and continues on the oppoſite ſide with the internal aponeuroſis. From the two aponeuroſes juſt deſcribed the muſcular fibres ariſe, and paſs obliquely to the anterior ſurface of that which covers the back of the muſcles, and to the ſides of the aponeurotic ſeptum, which exiſts in the ſubſtance of the muſcle. They deſcend along the interior ſurface of the tendo Achillis, to within three inches of its attachment to the os calcis.

Action of theſe Muſcles.—The muſcles of the calf are particularly employed in progreſſion; and their bulk and power, with thoſe of the gluteal muſcles, prove that the human ſubject was deſigned to walk erect. Hence man is particularly characterized by the largeneſs of his calf, and no animal equals him in this reſpect. In the attitude of ſtanding, when the foot reſts firmly on the ground, the ſoleus, having its fixed point in the heel, keeps the leg backwards, and prevents it from obeying the tendency, which the weight of the body gives it, to bend forwards on the foot. When the leg has been carried forward on the foot, the latter part being fixed to the ground, this muſcle will reſtore it to its erect poſition, by moving it backwards on the foot. The gaſtrocnemius fixes the thigh behind, as the ſoleus does the leg; and oppoſes the cruralis and vaſti which hold the bone in front. When their action is carried beyond the degree now deſcribed, the gaſtrocnemius may bend the thigh backwards, or the ſoleus the leg.

By lifting the heels, when the body is erect, the muſcles of the calves elevate the whole body, which is ſupported on the two aſtragali: the weight is there maintained by the anterior part of the feet, and the individual is ſaid to ſtand on tiptoes. If the foot of one ſide be lifted from the ground, and the oppoſite heel be raiſed by the calf of its own ſide, the whole body is then elevated by the muſcles of one calf. When a perſon ſtands on tiptoe with a burden on the ſhoulders, or any other part of the trunk, the weight of this, as well as of the body, muſt be elevated and ſupported by the muſcles of the calf.

In progreſſion, the ſoleus and gaſtrocnemius, by lifting the heel, make the foot deſcribe a ſemicircle, the point reſting on the ground, and the heel being elevated. This motion increaſes the length of the lower extremity by the whole length of the foot, and gives an impulſe to the trunk, which propels it forwards. See the article EXTREMITIES for a further account of the mechaniſm of this motion. Running puts theſe muſcles in powerful action: the front of the foot only reſts on the ground at each ſtep, the back portion being kept conſtantly elevated. Their action is equally obſerved in leaping, at the inſtant when the heel quits the ground. We may obſerve here that theſe muſcles of the lower limbs, which, by their ſudden contraction, ſtrengthen the previouſly bent articulations, are by far the moſt powerful. This may be ſeen in the ſoleus, with reſpect to the ankle, in the vaſti and cruralis, to the knee, and in the gluteus maximus, to the hip. The height to which the hip is ſometimes elevated in leaping is aſtoniſhing. The fact is explained by the power of theſe muſcles, diſpoſed firſt behind, then in front, and then behind again, to accord with the alternate directions in which the joints are bent. The vaſt force exerted by the muſcles of the calf, in raiſing the body in jumping or dancing, accounts alſo for the rupture of the tendo Achillis. The unfavourable manner in which the muſcles act in elevating the body, when we aſcend an eminence, explains the weight and fatigue experienced at thoſe times in the calf of the leg. The gaſtrocnemius may aſſiſt the flexors of the knee in bending the leg on the thigh.

The plantaris, from its diminutive ſize, can have but little ſhare in the movements juſt deſcribed: it muſt produce juſt the ſame effect as the gaſtrocnemius. As it is frequently abſent, its office cannot be very important.

GASTROCOLICA VENA, (from γαστηρ, the *ſtomach*, and κολον, the *colon*,) a vein, which pours its blood into the vena portarum. See VEIN.

GASTRO-COLICUM OMENTUM, is the ſame as the great omentum. See EPIPLOON.

GASTRODIA, in *Botany*, (γαστροειδης, having a ſwelling, or ventricoſe, form; in alluſion to the ſhape of the flower, which in this family is ſingular.)—Brown Prod. Nov. Holl. v. i. 330.—Claſs and order, *Gynandria Monandria.* Nat. Ord. *Orchideæ.*

Gen. Ch. *Cal.* Perianth ſuperior, coloured, of one leaf, tubular; the orifice in five ſhort, oblique, rather unequal lobes, all directed toward one ſide. *Cor.* Petals none. Nectary encloſed in the calyx, lying on the organs of impregnation, ſupported by a claw, unconnected. *Stam.* Anther terminal, moveable, deciduous, its cells cloſe together; maſſes of pollen of large angular particles, cohering elaſtically. *Piſt.* Germen inferior, pear-ſhaped, nearly globular, ribbed; ſtyle columnar, elongated, but ſhorter than the calyx, excavated at the top, thickened at the baſe in the fore-part, where the ſtigma is ſituated. *Peric.* Capſule nearly globular. *Seeds* numerous?

Eſſ. Ch. Calyx of one leaf, tubular, five-cleft. Lip ſtalked, unconnected. Anther vertical.

1. G. *ſeſamoides.* Native of Port Jackſon, where, according to Mr. R. Brown, it is very rare, he having never ſeen more than ſix or ſeven ſpecimens. We received one from

from Dr. White many years ago, whofe flowers we cannot afford for diffection, and therefore have borrowed the above account of their internal parts from our accurate friend Mr. Brown. The *roo* is parafitical on thofe of other plants, flefhy, branched, and jointed. *Stalk* fimple, erect, a foot high, fmooth, leaflefs, bearing two diftant, fhort, abrupt, entire, membranous fheaths. *Clufter* terminal, fimple, of fix or feven drooping, pale blufh-coloured flowers, refembling thofe of *Sefamum orientale*, but fmaller, and highly remarkable in their natural order for having a tubular calyx of one leaf, which in fact combines what we have taken for calyx and corolla in other *Orchideæ*. See CYMBIDIUM, DENDROBIUM, EPIDENDRUM, EPIPACTIS, &c. Linnæus would have termed it a petal, Swartz a calyx. This plant has moft affinity with *Satyrium Epipogium* of Linnæus, referred by Swartz to *Limodorum*. See EPIPOGUM. S.

GASTRODYNIA, in *Medicine*, from γαςὴρ, the *ftomach*, and ὀδύνη, *pain*, is a term applied by the nofologifts to thofe varieties of pain in the ftomach, which arife independently of inflammation in that organ. See GASTRITIS.

Hoffmann, and fome other writers, exprefs the fame idea by the word *Cardialgia*; while Sauvages and Cullen employ both the terms, making an arbitrary diftinction in their acceptation of them. Sauvages diftinguifhes cardialgia from gaftrodynia, by applying the former to pain or uneafy fenfation about the region of the ftomach, which is accompanied by a tendency to fyncope, or fainting; and ufing the latter to denote a more acute pain of that region, without any fuch concomitant difpofition. But the diftinction of Dr. Cullen, who reftricted the term cardialgia to what is popularly underftood by the word *heart-burn*, is more generally adopted. "For thofe pains that are either acute or pungent, or accompanied with a fenfe of diftention, or of conftriction, if they are at the fame time not attended with any fenfe of acrimony or heat, I employ the appellation of *gaftrodynia*. To exprefs thofe painful or uneafy fenfations which feem to arife from a fenfe of acrimony irritating the part, or from fuch a fenfe of heat as the application of acrids, whether externally or internally applied, often gives, I employ the term of *cardialgia*; and by this I particularly mean to denote thofe feelings which are expreffed by the term *heart-burn* in the Englifh language." (See Cullen, Firft Lines, § 1427. Sauvages, Nofol. Meth. Clafs vii. Gen. 20 & 21. Hoffmann, Medicina Rat. tom. ii. § ii. cap. 2.) The Englifh terms cramp in the ftomach, ftomach-colic, &c. are fynonymous with gaftrodynia, which alfo includes thofe more obtufe and chronic pains, which accompany the organic derangements of the apertures of that vifcus, or of its coats. The word *colic*, however, which ftrictly denotes a painful affection of the *colon*, or great inteftine, has been improperly transferred to pain, connected with the other abdominal organs.

Pain in the ftomach is occafioned by a variety of matters taken into it, and by various morbid conditions of its coats; fo that Dr. Cullen, confidering it as a mere fymptom, has not allowed gaftrodynia a place in his nofological arrangement. It is more efpecially mentioned by him as one of the numerous fymptoms which indicate a debilitated condition of the digeftive power of the ftomach, or *dyfpepfia*; in which cafe it is accompanied by other indications of the fame debility, as by a difcharge of wind, a fenfe of weight and fullnefs after meals, belching, naufea, foul tongue, &c. (See INDIGESTION.) The pain, under fuch circumftances, is excited fometimes by over-diftention of the fibres of the ftomach by flatulence, (Gaftrodynia *flatulenta* of Sauvages,) or by irregular fpafmodic contraction of fome portion of the organ, (G. *fpafmodica*,) as occurs in the bowels in colic; or by the prefence of an overload of undigefted aliment, (G. *faburralis*); or of worms; or of bile, or other acrimonious fecretion, (G. *verminofa* and *biliofa* of the fame author.)

It has been well obferved by Dr. Pemberton, in his "Practical Treatife on various Difeafes of the abdominal Vifcera," that the pain in the ftomach, connected with this dyfpeptic ftate of it, is moft felt, in fome cafes, when the ftomach is empty; and in others, when the ftomach is full. This confideration, that the pain is mitigated or removed by the application of food in the one inftance, and by the withholding it in the other, leads us to infer a difference in the proximate caufe of the pain, and in the nature of the remedies neceffary to cure it, in the two cafes. "That pain," Dr. Pemberton remarks, "which is moft felt when the ftomach is empty, feems to arife from an altered and increafed fecretion of the glands of the mucous membrane of that organ. This fluid, by its acrimony (if I may be allowed the expreffion) irritates the nerves of the ftomach, and thus caufes pain. When it is fecreted in fmall quantities, it may be fo enveloped by any food that is taken, as to render it inert; or when it is fecreted in larger quantities, it may be thrown up, after caufing violent pain, by vomiting: and in this ftate it conftitutes what is called *pyrofis*, or *water brafh*." (Loc. cit. p. 101.)

"The pain of the ftomach, which is moft felt when it is full, would appear to arife from irritability of the mufcular coat of that organ, and not to be at all connected with the glandular fecretions of it; for unlefs the pain be called forth by food being received, it will reft perfectly at eafe. The food will remain down perhaps half an hour (or more) before any uneafy fenfations are created. Thefe then will go on increafing till the food is returned again, very little changed from the operation of digeftion. This difeafe is attended with fympathetic head-ache; it feems particularly to attack chlorotic women, and hypochondriacal men; I am therefore inclined to believe that it owes its origin to the mufcular fibres of the ftomach, partaking of the general irritability of all other mufcular parts in an irritable habit; and I think that the advantage derived from the method of treatment hereafter mentioned, will add confiderable ftrength to this opinion." (P. 115.)

The following *diagnoftic* fymptoms, by which this form of gaftrodynia may be difcriminated from the pain arifing from organic difeafes of the ftomach, are ftated by the author juft quoted. It may be diftinguifhed from that pain which is produced in a ftricture of the *cardia*, or upper orifice of the ftomach, by the pain not being perceived *the inftant* the food is fwallowed, by the feat of the pain not being confined to one fpot, and by there having exifted conftitutional derangement *previous* to the ftomach affection; whereas, in ftricture of the cardia, the conftitution is *fubfequently* affected. It may be diftinguifhed from *fcirrhus* or *cancer* of the ftomach, by the pain not being produced, except after taking food; whereas, in either of the former cafes, there is more or lefs of conftant pain; and in cancer, what is brought up from the ftomach is ufually very offenfive, and is alfo more or lefs of a dark brown hue.

Among the exciting caufes of pain in the ftomach, the fwallowing of poifonous and indigeftible fubftances, which, by their chemical or mechanical properties, injure the texture, and irritate the nerves of the ftomach, muft not be omitted. Thefe occafion the gaftrodynia *à veneno*, and G. *à peregrinis* of Sauvages. Not only the more active and corrofive fubftances, denominated poifons, fuch as arfenic, mercurial, antimonial, and other metallic falts, the undiluted mineral acids, &c. operate in this way; but even the draftic drugs given for the purpofe of exciting an emetic or cathartic

tic action, fometimes produce a confiderable degree of gaftrodynia, when imprudently adminiftered in an over-dofe. (See Hoffmann, loc. cit.) There are many examples on record of various fubftances, altogether foreign to the ufe of man, being fwallowed with impunity; fuch as pieces of money, pins, needles, glafs, fhells, the ftones of fruit, &c. but there are alfo numerous inftances, in which the moft diftreffing gaftrodynia, ultimately terminating fatally, has been the confequence. One of the moft extraordinary inftances of the original impunity, but ultimate fatality of fuch a practice, lately occurred in Guy's Hofpital, in the perfon of an American failor; who, between the years 1799 and 1805, had fwallowed upwards of *thirty clafp-knives*, which caufed his death in March 1809, after a long feries of fuffering. (See Annual Med. Regifter for 1808, vol. i. p. 380.)

Pain in the ftomach is often connected with certain ftates of the gout, with hyfteria, and with hypochondriafis, and therefore to be treated by the remedies which are requifite for the removal of thofe difeafes refpectively.

The Cure of Gaftrodynia muft neceffarily be as various as the caufes which give rife to it; and thefe will require an accurate inveftigation, by attending to the other fymptoms of diforder with which it may be accompanied, before we attempt the adminiftration of remedies. When the figns of impaired digeftion, already mentioned, concur with the pain, if it is known that any fubftance of difficult digeftibility has been fwallowed, or that any excefs of eating has been committed, it may be convenient to rid the ftomach of part of its over-load, by means of an emetic or a gentle cathartic; a practice, indeed, which is often indicated by the efforts of the conftitution to relieve itfelf by a fpontaneous vomiting or diarrhœa: in this cafe thefe efforts only require to be aided by diluent, tepid drinks, or glyfters. Afterwards the ftrength of the ftomach may be reftored by the ufe of the vegetable bitters, or other tonic medicines, together with regular exercife, and the plan adapted to the cure of *indigeftion* (which fee). When there is much flatulence, the exhibition of thofe cordial ftimulants, which have been called carminatives, will afford relief to the pain arifing from over-diftention, and aid the general plan. The aromatic vegetable matters, the diftilled waters from dill, coriander, pepper-mint, and plants of fimilar property, fmall dofes of æther, &c. may be employed for this purpofe. When the pain occurs in violent and fudden paroxyfms, the fpafms may be relieved by any active ftimulant, fuch as the æthers, cordial tinctures, wines, preparations of opium, the internal and external application of heat, by means of warm drinks, fomentations, or by a dry heat externally applied to the region of the ftomach. In cafes where there is a frequent eructation of an acid fluid, or even of the taftelefs fluid, which conftitutes the water-brafh, alkaline medicines are frequently of confiderable benefit. Sometimes alfo the generation of acid in the ftomach is prevented by an oppofite method of treatment, namely, by the ufe of the mineral acids, which put a ftop to the acetous fermentation out of the body. With thefe means of obtaining temporary relief, thofe remedies which ftrengthen the digeftive powers, as above mentioned, muft be alternated or combined.

For that pain which is moft felt when the ftomach is empty, and which Dr. Pemberton confiders as arifing from an altered ftate of the glandular fecretions of its internal coat, he confiders the combination of opium with aftringents as the moft effectual remedy; and he prefers the form of pill as affording the moft permanent application of the medicine. In the incipient ftages he employs pills of opium and kino, or of opium and alum. When the fecretion of the fluid appears to be moderated, the tone of the ftomach may be reftored by a chalybeate water, or by fteel in fome other form. The diet, Dr. Pemberton adds, fhould be plain-dreffed animal food, with a fmall proportion of vegetables. The patient fhould be particularly cautious not to take a large quantity of bread. He fhould moreover abftain entirely from fermented liquors, as he fhould from hot broths, fifh, and in fome cafes from eggs.

In that pain of the ftomach, which arifes when the ftomach is full, and which is confidered as a local difeafe, in confequence of conftitutional derangement, the method of treatment muft be, for the moft part, conftitutional, regard being paid at the fame time to the ftomach itfelf: and Dr. Pemberton confiders the green draught of myrrh, foda, and fulphate of iron, or Griffith's mixture, as comprehending every ingredient which will meet this intention. Should it happen that the pain in the ftomach is extremely violent, a fmall dofe of an opiate may be taken half an hour before dinner, or added to each dofe of the mixture above mentioned. A combination of opium with the carbonate of ammonia, taken in the fame way, has fometimes appeared to be very efficacious.

A remedy was fome time ago recommended by Dr. Odier, of Geneva, for the cure of that form of gaftrodynia which is fpafmodic, and connected with an increafed irritability of the ftomach; namely, the white oxyd of bifmuth, or, as it is called in the fhops, where it is chiefly fold as a cofmetic, the magiftery of bifmuth. Dr. Odier employed this remedy "in dofes of fix grains, four times a day, in all cafes of fpafms of the ftomach, brought on by any kind of aliment, and proceeding only from the irritability of that organ." (See a paper by Dr. Marcet, in the Memoirs of the Med. Soc. of London, vol. vi. p. 155.) We have feen a few ftriking inftances of the efficacy of the bifmuth in certain forms of gaftrodynia; but in others, in which no obfervable difference in the circumftances could be detected, it has appeared to be altogether inert. It may be given in much larger dofes, than thofe above mentioned; we have feen a fcruple taken three times a day with impunity, or rather without any effect whatever. The common magiftery, fold for cofmetic purpofes, is often an impure oxyd, mixed with nickel, cobalt, or other fubftances.

When gaftrodynia is occafioned by the prefence of poifons or other extraneous matter in the ftomach, we muft endeavour by evacuant medicines to difcharge them, or by means of diluents or chemical agents, to weaken the operation of the poifonous fubftances, or farther to defend the ftomach in fome degree againft the irritation of both, by means of mucilaginous and oleaginous medicines. See Poison.

GASTRO-EPIPLOIC, in *Anatomy*, (from γαςηρ, the *ftomach*, and επιπλοον, the *omentum*,) a name given to certain arteries and veins, which are diftributed to both thefe organs. See Artery and Vein.

GASTRO-HEPATICUM Omentum. See Epiploon.

GASTROLATER, of γαςηρ, and λαλξευω, *a glutton*, or *belly-god; cujus deus venter eft.*

GASTROMANCY, or Gastromantia, a kind of divination, practifed among the ancients, by means of words coming, or feeming to come, out of the belly.

The word is Greek, γαςρομαντεια, compofed of γαστηρ, *belly*, and μαντεια, *divination*.

There is another kind of divination, called by the fame name gaftromancy, which is performed by means of glaffes, or other round, tranfparent veffels, within which certain figures

figures appear by magic art. It is thus called, becaufe the figures appear as in the belly of the veffels.

GASTROPODA, in *Zoology*, a fub-order in the clafs of *Mollufca*. See CLASSIFICATION of *Animals*.

GASTRORA'PHE, or GASTRORA'PHIA, a term, in *Surgery*, derived from γαστηρ, the *belly*, and ῥαφη, a *future*, or *feam*. It means the fewing up of a wound of the abdomen, or inteftines; a proceeding, which is hardly ever deemed neceffary, or proper, by the moft eminent modern furgeons.

With refpect to fewing up a wound of the parietes of the abdomen, furgical writers inform us, that either the common interrupted future may be ufed, (fee SUTURE,) or the quilled one, which is generally reprefented as that to which a preference ought to be given. The quilled future is practifed on the abdomen, as follows; a ligature, capable of fplitting into two, is to have a needle faftened to each end of it. The operator is to put the index finger of his left hand into the wound, under the lip, which is furtheft from him. This finger is placed in contact with the peritoneum, in order that it may, with the affiftance of the thumb, pinch up and raife the whole thicknefs of the parietes. With the right hand, one of the needles is to be introduced into the abdomen, its point being guided on the index finger, fo as to be kept from wounding the omentum and inteftines. We are directed to pierce the lip of the wound, from within outward, about an inch from its edge. The other needle is to be paffed in the fame way through the oppofite lip. Then the two needles are to be cut off. As many fuch futures muft be made as the extent of the wound may require. The fides of the wound are next to be brought together, and we are to prepare to tie the ligatures, not in a bow, in the way of the interrupted future, becaufe, it is faid, the continual action of the abdominal mufcles might make the ligatures cut their way through the parts. Hence we are directed to fplit each end of the ligatures into two portions, and to tie thefe over a piece of bougie, laid along the line, at which the ligatures emerge from the flefh. This is to be done to all the ligatures on one fide firft. Then, the wound being clofed, another piece of bougie is to be placed, in a fimilar manner, along the other lip of the wound; and the oppofite ends of the ligatures are to be tied over it, with fufficient tightnefs to keep the fides of the wound in contact.

Although we cannot allow, that this future is proper in ordinary wounds of the abdomen, we believe that it is preferable to the interrupted one, becaufe a great deal of its preffure is made on the two pieces of bougie, and, of courfe, the ligatures muft be lefs likely to cut their way out. Its operation is to be affifted with the uniting bandage, or ftrips of adhefive plafter, and with compreffes laid over each fide of the wound, under the bandage. Every thing fhould be avoided which tends to put the abdominal mufcles into action, by which means the future would be dragged, the wound irritated, and a rifk created of the threads cutting their way through the flefh. In order to prevent, as much as poffible, all exertion of the abdominal mufcles, the bowels fhould be kept open with glyfters; and no medicine is fo good as opium for putting a ftop to the vomiting, which is fometimes attendant on wounds of the abdomen, and apt to produce a very hurtful difturbance of the wound.

The quilled future receives its name from the circumftance of a quill having been formerly ufed inftead of a piece of bougie. The ligatures may generally be withdrawn in about a week, and fticking-plafter ufed with only common dreffings.

Gaftroráphe, in the fenfe of fewing up a wound of the external parts of the abdomen, muft generally be regarded as a highly unneceffary proceeding, unproductive of any good, and likely to occafion a great deal of avoidable irritation and pain. It has now been proved, by repeated and manifold experience, that all ordinary wounds of the belly may be united by means of common dreffings, a proper pofture, and fome kind of bandage. There is an excellent paper fhewing the ill effects of futures, by M. Pibrac, in the Mémoires de l'Academie de Chirurgie, tom. 3. This gentleman has adduced many interefting cafes, where extenfive wounds of the belly were cured in the moft favourable manner, without the aid of futures. The large wound, made in the Cæfarean operation, has alfo been often healed, as well as poffible, without fewing the parts together. We feel it unneceffary, however, to fay more at prefent on the general impropriety of futures, as we fhall have occafion to refume the confideration of it hereafter. See SUTURE.

We can juft conceive a cafe in which it might be found abfolutely neceffary to ufe a future. For inftance, were an extenfive tranfverfe wound to be made through the parietes of the abdomen, this plan might be the only means capable of preventing an actual protrufion of fome of the vifcera. Yet, even in this circumftance, the ftitches fhould be as few as the ftate of things will allow. With refpect to longitudinal wounds, the uniting bandage, with ftrips of adhefive plafter, is fully fufficient to keep their lips in contact.

Gaftroráphe, in the fenfe of fewing up fome breach in the inteftinal canal, is now never practifed by the moft eminent furgeons. We mean the reader to underftand, that a future is never employed with a view of holding the edges of an inteftinal wound together, though it may be deemed expedient, in certain cafes, to faften a thread to a wounded inteftine, by which means the injured bowel may be retained near the external wound, fo as to enable any extravafated matter to find its way out. See WOUNDS.

The old writers, who faid a great deal about gaftroráphe, feem rather to have done fo from cuftom than reafon. What they meant by the term could hardly ever be practifed; becaufe the fymptoms laid down for diftinguifhing when an inteftine is wounded do not, with any certainty, determine in what particular part it is wounded, which want of information makes it abfurd to open the abdomen to get at the injured part. Hence, in former times, when fewing together living parts was lefs horrid, the operation of ftitching the bowels could hardly have been done, by the moft rafh practitioner, except when they were both wounded and protruded. At prefent, even in this uncommon cafe, a good furgeon would not proceed to few up the breach, as an old woman mends a hole in a glove. At moft, he would only faften a thread to the wounded part before returning it into the belly. Gaftroráphe, in fhort, was always more talked of than executed; and Du Verney, who was for many years the moft eminent furgeon in the French army, during feveral campaigns, and who, moreover, lived at a period when the fafhion of fighting with fwords commonly prevailed, acknowledged, that he had never met with a cafe which required the performance of gaftroráphe, that is, the operation of ftitching the bowels. It has alfo been propofed to few the ends of the inteftinal canal together, in inftances of mortified herniæ. However, there are ftrong objections to fuch practice, as will be hereafter explained. See HERNIA.

GASTROTOMIA. A term, fignifying the operation of cutting into the abdomen. The word is derived from γαστηρ, the *belly*, and τεμνειν, to *cut*. It often denotes the Cæfarean operation, or that of cutting into the uterus in order to extract the fœtus.

GASULON, in the *Materia Medica*, a word ufed by Avicenna and Serapion, to exprefs fometimes the plant hyffop, and fometimes nitre. Thefe are two very different things to be known under the fame name; but the proper interpretation of the word being the *cleaning of clothes*, it was ufed probably at fome time to fignify every thing of an abfterfive quality; but among the many things of this kind once called by it, the two above mentioned are all that we find recorded, which may be eafily diftinguifhed by the context.

GATA, in *Geography*, a town of Spain, in the province of Eftramadura, on a river of the fame name, which rifes near the town, and runs into the Alagon, 15 miles S.W. of Coria. The town is 15 miles N.N.W. of Coria.

GATA, *Cape*, or *Cape de Gat*, a promontory of Spain, on the coaft of Grenada, confifting of an enormous rock of a fingular nature and appearance, 24 miles in circuit, and 13 broad. In the centre of this promontory are four hills, near each other, called the Sacriftan, the Two Friars, the Captain, and the White Mountain. The other fide of the promontory, beyond thefe four hills, is called "El Puerto de la Plata," where the Moorifh corfairs lie lurking for Spanifh veffels. N. lat. 36° 43'. W. long. 2° 22'.

GATAKER, THOMAS, in *Biography*, was born in London in 1574. Having attained a good ftock of grammar learning, he was, at the age of 16, fent to St. John's college, Cambridge, where he greatly diftinguifhed himfelf, as well for his indefatigable diligence, as for the modefty of his manners and the excellence of his difpofition. He had the misfortune to lofe his father in a fhort time after he had been at college, and was by this circumftance left without the means neceffary to continue him at the univerfity. Some benevolent and zealous friends contributed to his fupport, and he was thus enabled to complete his ftudies. In due time he took his degrees, and was, on account of the general eftimation in which he was held, appointed one of the fellows of Sidney college, even before the inftitution was erected; but in the year 1599, when the college was finifhed, he entered upon his duties as tutor with great reputation and fuccefs. While he was engaged in this employment he formed a plan, with others, of preaching at the neighbouring villages. After a refidence of fome months, Mr. Gataker quitted the univerfity with a determination to fettle in London. He firft engaged as chaplain to fir William Cooke, a fituation which proved the means of his introduction to many perfons of eminence and learning, particularly in the profeffion of the law; this led to the honourable poft of preacher to the fociety of Lincoln's-inn, the duties of which he difcharged with great reputation for ten years. By the acceptance of this office Mr. Gataker did not diffolve his connection with fir William Cooke's family, though in termtime he thought it his duty to refide in Lincoln's-inn. In 1603 he took his degree of bachelor of divinity at Cambridge, and might have proceeded to that of doctor, but declined it for economical reafons. The reputation which he acquired by his difcourfes at Lincoln's-inn chapel occafioned feveral inftances of valuable preferments to be offered to him, which he might have held without relinquifhing his fituation of preacher to that fociety. But he felt it was not right for any man to hold offices, the duties of which he could not perform, and therefore he fet his face againft all pluralities. It was his wifh alfo to continue as he was, becaufe his prefent fituation, though the income of it was fmall, afforded him leifure to purfue his learned ftudies. To thefe he devoted much of his time, particularly to the ftudy of the Scriptures in their original languages. In 1611 Mr. Gataker entered the matrimonial ftate, and accepted the rectory of Rotherhithe. He now applied himfelf with all diligence to the duties of the paftoral office. In 1616 Mr. Gataker maintained a correfpondence with archbifhop Ufher on fome literary fubjects. Several of the letters which paffed between them are preferved in the collection fubjoined to the life of the archbifhop, which afford abundant evidence of the great knowledge and critical acumen of Gataker, and of the high efteem in which he was held by that learned prelate. While Mr. Gataker was preacher at Lincoln's-inn, he had devoted feveral fermons to the confideration of the nature, ufe, and abufe of lots, intended to fhew the lawfulnefs of innocent and entertaining games of chance, and the unlawfulnefs of the divinatory lots. What he delivered on this fubject had been much mifreprefented, and he was accufed of having pleaded in behalf of gamblers, and encouraged the abufe and mifemployment of time. In juftification of his own conduct he publifhed the fubftance of his fermons, under the title "Of the Nature and Ufe of Lots, a Treatife hiftorical and theological." This work occafioned fome controverfy, but it was received with confiderable applaufe by the learned. In the year 1620 Mr. Gataker fet out on a tour through the Netherlands; at Middleburgh he preached to the Englifh church, and diftinguifhed himfelf by the fpirit and ability with which he difputed againft the Catholic priefts, who refided in thofe parts, together with the fugitives of their perfuafion who had been obliged to quit England, for being concerned in the plots againft the government during the reigns of Elizabeth and her fucceffor. Upon his return to England, he found that his Treatife on Lots had been attacked by Mr. John Balmford, whofe work was prohibited on account of its virulence and illiberality. He firft employed his intereft in getting the prohibition removed, and then took up his pen to anfwer his antagonift. Some years afterwards he found himfelf called on again in defence of the fame work, and publifhed a juftification of his arguments in the Latin language. In 1624 he entered the lifts in defence of the Proteftant religion, againft the Catholics. His firft piece was entitled "Tranfubftantiation declared by the Confeffion of popifh Writers to have no neceffary Foundation in God's Word, and demonftrated to be againft Scripture, Nature, Senfe, and Reafon." In 1642 he was appointed to fit in the affembly of divines at Weftminfter, and he attended in his place from a pure defire of promoting truth and peace, and of rendering what fervice he could to the religious interefts of his country. In fome cafes he differed from the majority, and, for the fake of peace, impofed on himfelf filence. In others he felt it a duty incumbent on him to cleave to his own fentiments, and, by ftedfaftly adhering to his opinions, he was enabled, upon the introduction of the covenant into the affembly, with the aid of others, whofe fentiments were fimilar to his own, to obtain confiderable qualifications before they agreed to fubfcribe. Mr. Gataker next engaged, with other members, in writing the "Annotations on the Bible," which were publifhed in the name of the affembly. Mr. Gataker was the author of the notes upon Ifaiah, Jeremiah, and the Lamentations, which are generally admitted to have much merit. While he was thus employed he was offered the mafterfhip of Trinity college, which he thought proper to decline, in order that he might have more leifure to attend to literary labours. He compofed two works, in which his learning and critical talents were very advantageoufly difplayed. The firft was a treatife on the name by which God made himfelf known to Mofes and the people of Ifrael, entitled "De Nomine Tetragrammato Differtatio, quâ Vocis Jehovah apud noftros receptæ ufus defenditur, &c." This has been frequently reprinted, and is to be found among the author's "Opera Critica," printed

printed at Utrecht in 1698. The fecond was entitled "De Diphthongis five Bivocalibus Differtatio philologica, in qua Literarum quarundarum fonus germanus Natura genuina Figura nova et Scriptura vetus veraque inveftigatur." In this the learned author endeavours to prove that in reality there are no diphthongs, and that it is impoffible that two vowels fhould be united in fuch a manner as to form one fyllable. During the compofition of thefe learned works, Mr. Gataker had been almoft laid afide from his paftoral duties by ill health; but when he was able he gladly returned to the duties of his profeffion, till, by the rupture of a blood-veffel, he was obliged to decline the fervice of the pulpit altogether. He now fpent his time almoft entirely in ftudy, and in 1648 he prefented to the world a work on the ftyle of the New Teftament, which gained him the character of being one of the ableft philologifts of the age. This was the precurfor to a much larger work of a fimilar nature, and of great ufe in illuftrating the fenfe of difficult paffages in the Old and New Teftament, the primitive fathers, modern critics, and alfo in profane authors both Greek and Latin. At firft only two of the fix books, into which it was divided, were publifhed, and the remainder were given to the world by his fon after the author's death. Without attempting to particularize all Mr. Gataker's works, we may obferve, that in 1652 he publifhed his edition of Antoninus's meditations, with a very valuable preliminary difcourfe on the philofophy of the ftoics. In 1648 he, with the other London minifters, to the number of 47, remonftrated againft the meafures taken by parliament againft the king and the eftablifhed government. He feverely condemned, in public and in private, the execution of the monarch, and the changes which were introduced into the conftitution. His fentiments on this occafion rendered him an object of fufpicion and jealoufy to the ruling powers, of which circumftance his parifhioners took advantage, and refufed to pay him his dues. Toward the clofe of a long life he was attacked by the famous aftrologer William Lilly, becaufe in his annotations on Jeremiah he had expofed the vanity and abfurdity of the judicial aftrology. To the ftrictures of the aftrologer, Gataker replied with energy, and expofed the ignorance and folly of the impoftor. A fecond attack from Lilly produced a rejoinder from the divine, which was the laft of his publications, for almoft as foon as it was finifhed he was feized with a fever, which proved fatal to him in the 80th year of his age. By his contemporaries Gataker was highly efteemed: he is called by Echard "the moft celebrated among the affembly of divines;" "and it is hard to fay," adds the hiftorian, "which is the moft remarkable, his exemplary piety and charity, his polite literature, or his humility and modefty in refufing preferments." He is equally praifed by Morhoff, Bayle, Colonius, and others. Befides the articles already enumerated, he was author of many other, the titles of which are given in the Biog. Britannica, to which our readers are referred for information refpecting this worthy man and excellent divine.

GATE, in *Architecture*, a large door, giving entrance into a city, town, caftle, palace, or other confiderable building; or an aperture of paffage for men, horfes, coaches, or waggons. The proportion of gates is from feven to twelve feet in width, and the height $1\frac{1}{2}$ the breadth. Where loaded carts of hay and ftraw are to pafs, the height may even be twice the breadth.

The gates of London were many of them converted into gaols or prifons, as Ludgate, Newgate, &c. but they are now removed. The leffer or *by-gates*, are called *pofterns*. Gates through which coaches, &c. are to pafs, fhould not be lefs than feven feet broad, nor more than twelve; the height to be $1\frac{1}{2}$ the breadth.

GATE, in *Rural Economy*, a frame of wood conftructed with a number of bars, and fixed in fuch a manner as to fwing upon hinges, for the purpofe of affording convenient paffage into and out of inclofed grounds, or other places.

In the conftructing of gates, of whatever kind or form they may be, the materials fhould conftantly be well prepared by proper feafoning before they are put together; as where this is not the cafe, they foon become much injured by their conftant expofure to the effects of the fun and wind. They alfo require that the different parts be put together with confiderable accuracy and correctnefs. In refpect to durability, there can be no doubt but that oak is by much the beft fort of wood to be employed; but fome of the more light kinds of wood, fuch as thofe of the deal, willow, and alder forts, anfwer the purpofe extremely well, and are very durable, as, on account of their lightnefs, they do not deftroy themfelves fo much in fhutting. It is found by experience that the lighter gates can be made in their fore-parts, fo that they be fufficiently ftrong for the intended purpofe, the better they anfwer. For this reafon, in fome cafes, as where horfes are chiefly to be confined, the top bars, by being left of more ftrength, may admit of the others having lefs fubftance; but if this be not done, they are apt to be broken by the horfes rubbing their necks upon them, unlefs where they are made of great height.

The width of gates for general purpofes is moftly from eight and a half to nine feet, and the height from five to fix feet; the bars being five or fix in number, and each four or five inches in breadth. Hence they are frequently denominated five or fix-barred gates. In cafes where fowls or other fmall animals are to be guarded againft, it is fometimes the cuftom to run a fmaller bar between the two lowermoft ones, as by this means their paffage is prevented.

In different fituations and diftricts gates are formed in very different manners, but thofe chiefly employed are of four kinds; namely, the fwing gate, the folding gate, the flip-bar gate, and the wicket or turn-about gate. Each of thefe forts of gates have likewife great variety in their forms, as may be feen in the annexed plate by the different figures.

The moft fimple form of gate is that of the flip-bar, which merely confifts in running three or four bars into the fixed pofts on each fide. Thefe are moveable at pleafure, fo as to make way for any thing to pafs. The pofts may be either of wood or ftone, being firmly fixed into the ground, and having proper holes formed in them for the reception of the bars.

A gate of this fort is feen at *fig.* 1. in *Plate (Agriculture) Gates*.

It has been obferved that this is perhaps the moft durable of any fort of gate, particularly where the gate-pofts are of ftone. The only objection that can be made to it is that of the trouble of opening and fhutting it, which, when perfons pafs through it in a hurry, renders it liable to be left open. Its cheapnefs and lafting property render it in every other refpect preferable to any other defcription of gate. The only inftances in which it does not perfectly anfwer, are thofe near the verge of a farm, or on the fide of a highway or other public road, as it does not admit of being locked or fecured as other gates are. In the whole of the interior of farms or eftates, it is, however, generally found the moft cheap, convenient, and ufeful gate that can be employed by the farmer.

The fwing gate is that which is next in the fimplicity of its conftruction. This varies very greatly in its forms and

dimenſions, as may be ſeen by referring to *figures* 2, 3, 4, 5, 6, 7, and 8, in the plate. The gate which is repreſented at *fig.* 2. is formed upon an improved principle; and highly eſteemed in many diſtricts of the kingdom. There is a projection on the fore-part of the har-tree as ſhewn at *a*, which riſes nine inches; and on which the lower end of the diagonal bar, that paſſes upwards, reſts; *bb* is the diagonal bar, through which the three middle horizontal bars paſs; *cc* is a perpendicular bar fixed into the uppermoſt bar, ſix inches from the inſertion of the diagonal one at *d*, and into the lowermoſt one at *e*; *f* is the ſpring on the fore-tree, by means of which the gate faſtens.

Another gate of larger dimenſions, but of the ſame kind, is ſhewn at *fig.* 3. in the ſame plate. In this there are, however, three upright bars, as ſeen at *aaa*, and *b* is the diagonal bar which acts as a brace to the whole.

A further improvement on this ſort of gate is repreſented at *fig.* 4. in which there are two diagonal bars meeting in the middle from the bottom extremities of the har-tree and fore-tree, with an upright middle bar, and two braces paſſing from the top till they meet the diagonal pieces. Theſe different parts are ſeen at *aa*, *bb*, and *c*.

Theſe are all highly uſeful forms of gates for farm purpoſes.

A common form of ſwing gate is likewiſe ſeen at *fig.* 5. in which there is ſimply one diagonal brace, which renders it capable of being conſtructed at but little expence.

An improved ſwing gate, recommended by Mr. Parker, in his "Eſſay on hanging and faſtening Gates," is repreſented at *fig.* 6. And he remarks that the gate that is in moſt general uſe in Shropſhire weighs about 130 pounds without the iron-work, and that its dimenſions are theſe:

	Inches	by	Inches.
Heel	5	..	$2\frac{1}{4}$
Head	$2\frac{1}{4}$	..	$2\frac{1}{4}$
Rail near heel	$3\frac{1}{4}$	..	3
——— head	3	..	$2\frac{1}{2}$
Bars near heel	$3\frac{1}{4}$	..	1
——— head	$2\frac{1}{4}$	..	$0\frac{3}{4}$
One diagonal and two perpendicular bars, or lacings, each	$3\frac{1}{4}$	..	1

It is added that the diagonal bar, riſing from the lower part of the heel of the gate, meets the middle of the rail, and the two upright bars are placed at proper diſtances, between the middle and the head of the gate: theſe croſs bars, it is ſuppoſed, muſt aſſiſt greatly in keeping the gate together, but that what is moſt to be guarded againſt is, the ſinking at the head; and to prevent which, the gate ſhewn in the above figure is not indifferently contrived.

It may be further noticed that the rail and the horizontal bars of this gate are much the ſame as thoſe juſt deſcribed, but that the diagonal bar *c* is let into the lower part of the heel *a*, with a firm reſt or butment, its upper end coming exactly into the angle formed by the rail *f*, and the head *b*; and it is alſo ſupported in its place by the upright bars *d* and *e*. From this arrangement it would ſeem that the bar *c* might be likely to puſh the head *b* out of its place, were it not counteracted by the upper thimble being attached to, or forming one end of a flat bar of iron, which paſſing through the heel and along the top of the rail, extends to the head of the gate, having been hammered into an equal width and thickneſs at the part which goes through the head, and is finiſhed at the end with a ſcrew and nut: the iron bar is fixed to the rail with five or ſix ſtrong nails, that ſecure the whole; and this, the writer ſuppoſes, appears to be much more likely to anſwer the purpoſe wiſhed for, than any other plan he has ever met with.

A gate of this kind, it is obſerved, has juſt been made for him by the direction of an ingenious mechanic; he cannot anſwer for its merits, but is aſſured that it has been tried with great ſucceſs. The weight of the iron ſtrap or bar is twelve pounds, which, at 5*d.* per pound, and 2*d.* for the ſcrew nut, will coſt 5*s.* 2*d.*; but it is queſtioned whether a much lighter bar, even ſo ſmall as half the weight of the above, would not be found to anſwer, if that of twelve pounds weight ſhould be thought too expenſive: the bars *c*, *d*, *e*, are $2\frac{1}{2}$ inches by $1\frac{1}{2}$, or a full inch. A gate of the common upright ſwing-kind is ſhewn at *fig.* 7. which is a good uſeful one where there is a neceſſity for one of the cloſe ſort. It has three rails, to which upright bars are nailed in a pretty cloſe manner.

At *fig.* 8. is ſeen an improved ornamental gate of this deſcription. It conſiſts of three rails, to which are nailed upright bars that reach conſiderably above the top rail, and it has two diagonal braces that meet in an acute angle in the middle of the top of the gate. The har-tree is alſo crooked at the top, in order to afford an ornamental effect. This is a cloſe ſtrong gate, but too expenſive for common uſes.

The great objection to ſwing-gates of all kinds is their liability to be deſtroyed by their great length of frame.

The folding-gate is found more convenient in many caſes than either the ſlip-bar or thoſe of the ſwing kind. An open folding gate, proper for common uſes, is repreſented at *fig.* 9. And one of the more ornamental cloſe kind is ſhewn at *fig.* 10. Experience has ſhewn that this deſcription of gate is much more durable than thoſe of the above kinds; as the bars, from being only half the length, render the joints not nearly ſo liable to be broken, or the hinges to be injured by over-ſtraining; and the difference in the firſt coſt conſiſts ſimply in the expence of a pair of additional hinges.

The wicket or turnabout gate is another ſort that is frequently found uſeful in particular ſituations. A gate of this deſcription, proper for common purpoſes, is ſeen at *fig.* 11, in the plate. And at *fig.* 12. is ſhewn one of the more ornamental ſort, which turns about on the middle or centre-poſt *a*, and is commonly formed of light iron work. It has a very neat appearance.

All ſorts of gates ſhould be carefully attended to in keeping them well painted, and free from dragging upon the ground in the fore-parts, as by ſuch care they will laſt much longer than where the contrary is the caſe.

Gate *Poſts*, the pillars or upright ſtrong pieces of timber, or other materials to which gates are hung and faſtened. Poſts for this uſe are formed of very different ſubſtances, but principally of ſtone or timber. It has been obſerved that where it can be done, they ſhould always be of ſtone, and ſuch as is hewn if poſſible, as theſe, when properly conſtructed, will laſt for ages: where wood is employed, oak well ſeaſoned is undoubtedly the beſt, and ſhould always be of conſiderable ſubſtance. In ſome places it is the practice to plant quick growing trees for this purpoſe, and when they have attained a ſuitable growth, to cut them over about ten feet from the ſurface: theſe, where the trees grow well, form very durable gate-poſts; but they ſometimes ſhrink, and occaſion much trouble in remedying the inconvenience. They are alſo liable to ſhake and get looſe by the wind. Where dead timber is made uſe of for this purpoſe, the

poſts

posts should be very strong, and the wood constantly well-seasoned; that part which is let into the ground being well defended by soaking it in coarse oil, charring, or giving it a coat of coal-varnish, and all that is above exposed to the action of the weather should be well covered with two or three good coats of some sort of oil paint. The expence incurred in this way is but little, while the advantage gained is very considerable.

It is supposed by Mr. Parker, in the essay mentioned above, that for timber gate-posts the substance should not be less than from eight to ten inches in the square, and that for very heavy gates a foot in the square is by no means too much. And even if formed of still larger size it is better. The steadiness of a gate-post in a great measure depends upon the depth to which it is set in the ground, which ought in some cases to be nearly equal to the height of it. But in general, five or six feet are fully sufficient for the purpose. A strong frame of wood placed under the ground, so as to connect with both posts, may in some instances be useful in keeping the posts steady without the labour of putting them in so very deep.

Since a well-constructed gate cannot be used to advantage without suitable posts, it is supposed necessary to say a few words about them. And, as much trouble and expence may be saved by a proper understanding in what regards their length and substance, the calculations given below are submitted to the reader's attention. It is suggested that an oak post ten inches square, and eight feet long, is sufficiently strong for suspending the gate shewn at *fig.* 6. in the plate; and it will contain five and an half feet of timber, or exactly 5 feet 6 inches and 6-10ths, the value of which must depend on its quality; but for common purposes the lower part of a tree of the dimensions shewn at *fig.* 13, will constitute four excellent posts for use, though their form may not be thought ornamental, and will contain by customary measure nineteen and an half feet, or exactly nineteen feet six inches and three-tenths, but the true measure of the part of a tree, such as seen at the above figure, is twenty-three feet, or exactly twenty-three feet one inch and three-tenths; this leaves to the purchaser of round timber, taking in the sap, an advantage, it is contended, in the proportion of from 50 to 39, or upwards of from five to four. A part of an oak-tree without the bark, fit for this intention, is seen at *fig.* 13. in the plate. The money estimate of these gate-posts is shewn below.

	£.	s.	d.
To 4 posts containing $19\frac{1}{2}$ feet customary measure, of moderately good oak, several inches of which, in the length towards the root, are of little or no value, taken together at 2*s.* a foot - - - -	1	19	0
32 feet of sawing at - - -		1	0
	2	0	0

If this be divided by four, it will give 10*s.* per post; which value, though seemingly high, will, it is asserted, be soon compensated, in the avoiding the continual charges of altering and propping insufficient posts. Besides, these dimensions exceed the size of ten inches square, even after allowing for the early decay of the sap on the round side of each post; insomuch that a part of a tree of smaller dimensions might serve for the purpose; suppose the circumference of a part of a tree without the bark, intended for four posts, were only 5 feet 8 inches, instead of 6 feet 3 inches and 4-10ths, which is the circumference answering to the diameter of 2 feet, it would contain 16 feet 9 inches and 6-10ths by customary measure, including the sap, which would be nearly equal, in strength, to 4 posts of 10 inches square; for each of such posts will measure, in the true way, more than five feet; and the four posts, as shewn at *fig.* 13, would be reduced 7*s.* in price, or 1*s.* 9*d.* each, leaving their value about 8*s.* 3*d.* a piece. Mr. Parker considers it as frivolous to add illustrations upon questions, to which similar cases are detailed, in every common book on mensuration of solids; but he feels it highly necessary to take notice of the outline of those facts, which, like other parts of the subject, are not generally practised upon: and further, should a gate of his recommendation be found to lodge its head upon the ground, he begs to be considered as *accountable* only for the *gate*, and not for the post on which it hangs, unless his advice in that respect may also have been duly attended to. And it must be understood that he is estimating the value of an oak gate-post of a certain strength, and not cavilling about the difference as to the customary and true measure of round timber, for the market price of timber is considered as applying to a particular measure, and taking into the account the waste in converting round timber to use.

It is a good method to prevent gate posts from falling forward, and the gate, of course, striking upon the ground, in the fore-part to have stumps placed against the front parts of them, at the time they are first fixed into the earth, in such a manner as that, while they act powerfully against the posts, they may not appear above the surface of the land, and prove inconvenient. These should always be strongly nailed to the posts, and be formed of well-seasoned pieces of oak, being firmly rammed up at the same time with the posts.

Gates, *Hanging and Fastening of.* The modes of fixing or attaching them to the posts, by hinges, or other means, in order that the gate may open and shut with ease and convenience; likewise the methods of securing them so as to keep them shut.

The hanging of gates is a business that requires some serious consideration to effect it in a proper manner. It is obvious that they should have a certain degree of velocity, without having too much, in shutting themselves; but this is not attained without some degree of difficulty. The author of the Rural Economy of the Midland Counties remarks, that though he had paid much attention to the hanging of gates in Yorkshire, both with pivots and hinges, and had acquired an adequate idea of the leading principles, yet not having committed it to writing, the real nature of it had escaped his recollection, and a false notion of it supplied the place; which was, that the only thing necessary was to throw the gate out of the upright, so as to lean towards the post; it being no matter whether this inclination of it was attained by the hooks or the thimbles. And that, led by this false notion, he had conceived that the simplest, and consequently the best way, to hang a gate, would be to put the hooks in exactly perpendicular to each other, and to give the fall by the thimbles alone. He consequently prepared a bottom thimble, with a clasp to take the har-tree, and with an eye at each corner, in order that the gate might be occasionally hung on one side or other of the fence, as the occupation of the inclosure might require, and with this thimble hung a gate.

The centres of the pins of the hooks being placed exactly perpendicular to each other by a plumb line, the gate was hung on; but instead of falling this way or that, it stood stationarily wherever it was set. Finding himself thus at a stand without inclination to remain long in such a disgraceful predica-

predicament, he ſet the workmen to other buſineſs, and himſelf to the inveſtigation of the principles of gate-hanging. After muſing for ſome time, with the gate in his hand, and ſketching his ideas afterwards on paper, he ſaw clearly, and to demonſtration, that the fall depended entirely upon the hooks; the axis of motion is given by the ſituation of the hooks with reſpect to each other; and, whichever way the axis of motion inclines, that way the gate will fall.

The theory of this principle is eaſily demonſtrable; but it requires diagrams to explain it, and is merely elementary. It is ſuggeſted that a gate ſhould have two, what are termed falls; one at the poſt, to make it catch; and another at a right angle to the gateway, to prevent its ſtanding open. The quantity of fall muſt vary with the uſes and length of the gate, and the judgment or fancy of the hanger. If a gate has too much fall at the poſt, it is liable to beat itſelf to pieces; if too little, it does not catch with ſufficient certainty, and is liable to be blown open by the wind, and thus become a deception, rather than a ſafe-guard. On ſufficient trial, it has been found, that for field gates, one inch and a half at the poſt, and an inch at the right angle, give what appears to the writer a proper fall to them.

In regard to the thimbles, the only uſe of their being made in this or that form, is, to counteract the croſs winding or obliquity of the hooks; ſo that the gate, when ſhut, ſhall hang plumb and level; or every way in a perfectly upright poſition. The way to aſcertain the true poſition of the hooks, is that of taking a plumb line, or any ſtring with a ſtone tied in it, and looking along the line of the fence or gateway, to drive the hooks, or move the poſt, until the centre of the pin of the upper hook appears, by the line hanging perpendicularly before the eye, an inch and a half nearer the middle of the fence, than that of the under one; and then looking along the line of the road, or perpendicularly to the gateway, ſee that the centre of the pin of the upper hook ſtands one inch nearer the middle of the road than that of the under hook; obſerving likewiſe that the pins of the hooks ſtand, not exactly upright, but in a line with each other, forming one direct axis of motion.

It is ſuggeſted, that as gates are liable to ſag, or ſink down by hanging, they ſhould conſtantly be hung ſomewhat above the level, rather than below it. The top thimble being uſually put into the middle of the har-tree, with the eye as near to it as the ſhoulder of the hook will admit, the counteraction of courſe depends on the bottom thimble. If this thimble be made with two ſtrong ſtraps, to claſp the lower part of the har-tree, as it always ought, with an eye on one ſide, or with two eyes, one on each ſide, and their centres three inches apart, with projecting necks, when fixed, one inch farther from the har-tree than that of the upper thimble, or, more accurately ſpeaking, with the centre of the eye or eyes of the lower thimble ſtanding an inch further behind the har-tree, than the centre of the eye of the upper one, the gate acquires, on a certainty, the requiſite fall, yet hangs level and upright when ſhut.

Other directions for effecting the buſineſs of hanging gates are ſtated in the corrected Report of the County of Northumberland. Having ſet the poſt perpendicular, let a plumb line *a b*, *figure* 2. in the plate, be drawn upon it; on this line at a proper height put in the hook C, ſo that it may project three inches and a half from the face of the poſt, and at a convenient diſtance below this, put in the lower hook D, an inch and a half to one ſide of the perpendicular line, and projecting two inches from the face of the poſt; then put the top loop or eye two inches from the face of the har-tree, and the bottom loop three inches and a half from it; and when thus hung, the gate will, it is contended, have a tendency to ſhut, in every poſition in which it may be placed.

For if the weight of the gate be repreſented by the line *c d* in the diagram accompanying *figure* 2, this, by the reſolution of forces, is reſolvable into other two, namely, *c e* and *d e*, as ſeen in the ſame diagram, the former repreſenting that part of the weight which preſſes in a perpendicular direction, and the latter, that part of it which preſſes horizontally, and gives the gate a tendency to ſhut. It is remarked that this is a principle that has been long known and practiſed in the hanging of gates that open in both directions.

This ſubject has been ſtill farther inveſtigated and explained in a late eſſay, by the ingenuity and exertion of Mr. Parker, who obſerves that "a gate, when ſuſpended by hinges, is a lever of the ſecond kind, in which the weight is placed between the power and the fulcrum; for it is evident, that the hand applied to the head of the gate is the acting power, that the gate itſelf is the weight to be raiſed or moved, and that the hinges are the fulcrum or centre of motion." And that "when the hooks or pivots upon which a gate is hung are preciſely in the ſame perpendicular line with each other, the gate will be at reſt wherever it may be placed; and the ſame power which is required to move a gate thus ſuſpended through any given arc of the circle, will be exactly ſufficient to bring the gate back to its former poſition; in proof of which he would inſtance a common door to a room with plain hinges. But the ſmalleſt variation of the hooks from their perpendicular line, will attach to a gate, ſo ſuſpended, one determinate line of reſt, and no other; and from any part of the circle which the gate may be made to deſcribe, it muſt have a conſtant tendency to fall to that line of reſt." That "the line of reſt for a gate will always be where the head of the gate approaches neareſt to the ground, and from thence being moved half a circle to the right or left, it will there attain its greateſt height, and ſupport itſelf, or with a very ſlight aſſiſtance may be ſupported in equilibrio."

But that "when a gate is in its line of reſt, or in its oppoſite line of equilibrium, the two hooks by which it is ſuſpended, and the centre of the gate's gravitation will be found to be in one and the ſame vertical plane: which will be eaſily underſtood by obſerving a common gate, whoſe hinges may be put on in any manner, however awkward or perverſe. And when the hooks are in a perpendicular line with each other, it can admit of no doubt, that they muſt always be in the ſame vertical plane with the centre of the gate's gravitation, becauſe they will be ſo with any third given point whatſoever.

"Theſe general principles are alſo applicable to any common ſwing-gate, which has two or more pivots or hooks at the lower hinge, when the poſition of either one of the lower pivots is conſidered with regard to the upper hook." And, in further explanation of theſe principles, a figure is given in the Eſſay, which is ſuppoſed "the outline of a gate 9 feet 2 inches long, from the fore-part of its head to its upper point of ſuſpenſion, repreſented in the line of reſt, as well as in the oppoſite line of equilibrium, ſhewing the velocity with which the gate is made to fall, from an elevation of 6 inches gained at the head, in attaining its line of equilibrium; eſtimated from the line of reſt, by means of the poſition of the two hooks, and the proportionate extra length of the lower thimble." It is added, that "the line of faſtening ſhould be 22 deg. 30 min. or 1-16th part of a circle

circle short of, or within the line of rest; and consequently the corresponding line of equilibrium will also be 22 deg. 30 min. short of the greatest extent of the gate's opening." But, however, in order "to prevent the gate being left unshut, it is advised that a short post should be placed at about half the distance between the road to be passed, and the fence adjoining the hanging-post, that is, 22 deg. 30 min. within the line of equilibrium; so that the gate should not open from its line of fastening more than about 135 deg. which will answer every purpose; and the hinges must be so adjusted, that the gate shall be perfectly upright at its line of fastening." It is conceived, that "a gate suspended in this manner cannot be left open, excepting in high winds, but will shut of itself, though not with an uniformly accelerated motion, as might be supposed; its velocity being rather increased, as it passes the middle part of its semi-circular course, and retarded again as it approaches its line of rest, coinciding with the proportionate rise of the head; allowing only for such acceleration as must be acquired while the gate, in falling with a continued motion, recedes more and more from the line of equilibrium: as the versed sine of the angle, formed by the gate with its line of rest, is to the length of 110 inches, which is the made radius; so will be the corresponding rise of the head of the gate to 3 7-16ths inches, or half the whole rise of the gate's head, at any given angle within the quadrant, and the rise in the head afterwards will be as the cosine of any given angle, formed by the gate with its line of equilibrium, in describing the complement of that angle, is to the length of the gate, or radius; so will be the corresponding rise of the head of the gate, to the remaining 3 7-16ths inches; which cosine of the angle formed by the gate, with the line of equilibrium, is equal to the sine of the complementary angle, or angle of the gate's progress, from a radius at right angles to, or equidistant from, the lines of rest and equilibrium, in performing its supplementary course. Thus it is evident, that though the rise of the gate at the head in the first 90 deg. or half of its semicircular course, be 3 7-10ths inches, yet in the first and last 22 deg. 30 min. of its course, it will rise only $\frac{1}{4}$ of an inch, or exactly 6-24ths and 69-116ths or a 24th in each respectively: and respecting the quarter fractions, the rise of the gate's head, and corresponding velocity of the gate's fall, in equal eighth parts of its semicircular course, is nearly in proportion to the numbers 6, 16, 26, 32, and then inversely, 32, 26, 16, and 6. And in order to illustrate the matter still more clearly, he adds a representation of the horizontal section of two hooks for a right-handed gate, opening one way, brought into one place of observation, the upper hook, the lower hook, the line of fastening, the line of rest, and the line of equilibrium. The diameter of the hooks 13-10ths of an inch, which is the proper size for a common gate. The horizontal distance of the lines falling from the two hooks, being 15-12ths, or 2-4ths of an inch, is the measure adapted to hinges which are 40 inches asunder. In adjusting the hinges, it is necessary that the upper thimble should incline $\frac{1}{4}$ of an inch from its centre, towards the hanging-post, and that the lower thimble should be screwed into the heel of the gate $\frac{1}{4}$ of an inch out of the straight line, inclining in the opposite direction, that is from, instead of towards, the hanging-post, both the thimbles together making a variation of the 6-12ths of an inch, and to correspond with this variation, the upper hook should measure, from the centre of the pin to the shouldering, about half the thickness of the heel of the gate, as the 1-6th inch inclination of the upper thimble will allow sufficiently for the gate hanging clear of the post. The longer hook must be 6-12ths inch longer than the upper hook, and must be driven into the gate-post 1 1-6th inch out of the perpendicular line of the perforated part of the gate-post, in which the hooks are to be received; as the lower thimble must also exceed the upper thimble in length 1 2-4ths inch, supposing the gate to be a right-angled parallelogram; or, at least, the rail and heel to be at right angles with each other, else the lower thimbles must be extended by a washer, to make up the deficiency, which, however, will not at all interfere with the velocity of the gate's fall; because the hooks are the centre of motion, upon which all adjustment, as to the gate's fall, depends: the places of the thimbles influencing only the upright position of the gate when fastened. The numbers of 8-12ths rather surpass, it is observed, the precise measure of their respective sides of the triangle, but are nearer to the truth in calculation, than any workman could attain in applying these directions; for, in neither case, do they exceed their true measure so much as 1-24th of an inch, and therefore, in the one, the clear sum of $\frac{1}{2}$ inch is assumed for general purposes, and should the hinges be less than 40 inches asunder $\frac{1}{2}$ inch will be rather too much; or, were they to be more than 40 inches distant from each other, $\frac{1}{2}$ inch, on the contrary, would be rather too little for the just proportion."

It is considered as certain, "that a small space must be lost in hanging a gate, though the hooks and thimbles be made with the greatest exactness; for the weight of the gate will draw the upper thimble to bear upon the hind part of the upper hook, and will press the lower thimble against the fore-part of the lower hook: this must, however, be trifling where the hinges are well fitted, and no allowance is made for it in the drawings which he has given; because the lower thimble gains as much upon the upper one by their being placed $\frac{1}{2}$ inch, that is $\frac{1}{4}$ inch each, out of the plane of the gate's extension, as appears by the difference of the sides of the triangle numbered 114-12ths, and 15-12ths equal to 1-12th inch, by the measure of 15-12ths, which is assumed but nearly about 1-14th inch more, as stated above; or, on the whole, equal to 1-8th inch, which is a good general equivalent for the loss in hanging a gate, and will usually be sufficient to preserve the upright position of the gate when fastened, without having recourse to a washer at the lower thimble."

He states, that the "velocity, as above given to the gate's fall, will be commonly sufficient, without any care of oiling the hinges; but the effect of wind cannot be counteracted in gates by any good construction of the hinges; for were a velocity given to a gate's fall, equal to the resistance of so powerful an agent, the gate would soon want repair, from the constant violence of its shutting, and be so much the heavier in the hands of a horseman: besides, when a strong wind blew in the same direction as that of the gate's fall, no man on horseback would be able to withstand its force; and well-constructed gates are most liable to be acted upon by wind from their wide extent of surface; but if passengers are so careless as to leave gates open under such circumstances, there will be one satisfaction remaining; that is, as soon as the wind ceases, the hinges must resume their property, and the gates fasten of themselves."

Different directions are also given for ascertaining the proper position of the hooks, in cases where the hinges of gates are more or less than 40 inches asunder; in proving the truth of which, "suppose," says he, "a gate to be 110 inches long, and that it is intended to rise at the head 6 7-8ths inches in its semicircular course, from the line of rest to the line of equilibrium, then as the length of the gate is to the distance

diftance between the two hinges, fo will be 6 7-8ths inches to double the horizontal diftance of two perpendicular lines, one falling from each of the hooks." Or, "take any other diftance of the hinges from each other, and the required extra length of the lower thimble may be found by placing the numbers 110, and 6 7-8ths, as the firft and fecond term of a rule of three proportions, and the new diftance of the hinges muft be the third term, the anfwer, divided by two, will be the fought-for horizontal diftance of the two, the perpendicular lines falling from the hooks (adding the lofs in hanging the gate), the anfwer for one is the meafure for the other."

It is believed that "thefe general rules will find a tolerable accurate meafure in all cafes; for where a gate, or wicket, is fhort and light, the friction of the hinges will be lefs in two refpects, both by the diminifhed preffure on the hooks, from the gate's lightnefs, and the reduced diameter of the pivots, which will fupply what is wanting in the weight or momentum of the gate. On the other hand, when the gate is long and heavy, its increafed weight, or momentum, and its length as a lever, will be oppofed to the additional frictions of the hinges." And further, that "in cafes where old hinges are badly made with large hooks or deep thimbles, that difficulty is to be met by taking the proportion for the diftance, of the two hinges, from each other, at five or ten inches more than it really may be, with reference to the given table, or by adding fomething to the ufual horizontal diftance, of the lines falling from the hooks. But when the thimbles are of a long cylindrical form, they are extremely apt to bind upon the hooks, and will fometimes put a dead ftop to the gate's motion. With fuch thimbles, the attempt of adding to the velocity of a gate's fall, may only increafe the binding or friction, and the remedy of this defect, therefore, is to make the hooks much fmaller than the thimbles; in new thimbles no form, but that of annular or ring-like, fhould be admitted. But by the lower thimble being furnifhed with a fcrew of equal diameter throughout its length, its extra length may be regulated to fo great a nicety as half a turn of the fcrew, and may either be let into the heel beyond the fhouldering, or lengthened out by a wafher, as circumftances require, in adapting it either for hinges, which are lefs than forty inches afunder, or the contrary, without the help of a blackfmith, or any frefh forging, which is always troublefome and expenfive. And if a gate finks at the head, without any fault in the hanging-pofts or hooks, the lower thimble may be lengthened out, to bring the gate upright, and the hooks remain unaltered."

Further, that "the gate-pofts being fixed about eight feet nine inches afunder, will be adapted for a gate nine feet long, or nine feet two inches, including the thimbles; the thimbles being attached to the gate in the manner above directed, let the gate be fupported where it is to hang and faften, and then drive in the upper hook, at a convenient diftance from the edge of the hanging-poft, fo that the upper hinge fhall not be in the way of any carriage paffing the road, but at the fame time fo near to the edge of the poft, as to lofe no more room from the road than is unavoidable by the head and heel of the gate, extending a little upon the two pofts. It is not neceffary to the gate, that it fhould lap againft the hanging-poft at all, but fince the head ought to meet the falling-poft at leaft with half its fubftance, or from that to two inches, the hanging-poft fhould be nearly as much covered by the heel, for the fake of uniformity.

"When the upper hinge is fitted, the gate ought to be fupported upright, for afcertaining the place of the lower hook, and if the thimbles are properly put on, the pofition of the lower hook cannot be miftaken. Both hinges being fitted, it remains to be found, whether the hooks are in their exact places; for this purpofe take two plumbed lines, with fine threads, and heavy even-fided plumbs: if the hooks are well finifhed, the obfervation refpecting their centres may be taken, by faftening the plumbed lines round the hooks, and letting them fall from the outfide of fimilar parts of the hooks; forty inches being the given diftance of the hinges, the horizontal diftance of the two lines falling from the hooks fhould be $1\frac{1}{4}$ inch, and in a line which forms an angle of $22° 30'$ with the gate's line of faftening: take, therefore, a common two-feet rule, and having opened the legs to the angle $22° 30'$, place one fide of it againft the plumbed lines, which ought to anfwer to the meafure of $1\frac{1}{4}$ inch, while the other leg of the rule fhould be parallel to the gate's line of faftening; a flight blow or two with a hammer, on one or both of the hooks, in the direction neceffary, will complete the adjuftment, and the gate will be found to fhut of itfelf for any time within $135°$, from its faftening, and without violence, whether open to the fmalleft, the greateft, or any intermediate angle prefcribed by the fhort poft, which fhould be placed to meet the middle part of the gate, at the angle of about $135°$ from the line of faftening. Further, it might be prudent before the fhort poft were put down, to afcertain at what line the gate will ftand open, or be poifed by the friction of its hinges, towards the line of equilibrium, which will difcover how near the workmen may have adjufted the line of faftening to $22° 30'$ fhort of the natural line of reft; and if the gate is found to fall properly, the fhort poft may be put up accordingly, though the method defcribed may not have been minutely purfued; taking care that the fhort poft be fufficiently within the line of equilibrium, and that the gate fet off from the fhort poft with a velocity equal to overcome any increafed friction by ruft of the hinges; for oil fhould not be ufed at all, as its occafional aid is not to be depended upon."

It is further ftated, that "indifferent gate-pofts are liable to get out of their right pofition; the conftant weight of the gate muft have a tendency to pull the hanging-poft inwards; the fall of the gate may make the falling-poft recede from the direction of the frequent blows it receives, and heavy carriage-wheels paffing near the pofts, will occafion them to open outwards, and the natural or artificial flopes of the ground adjoining gate-pofts often affect their upright pofition, and decline them from the higher ground, and many other caufes, produce fimilar effects; to obviate which, many contrivances have been recommended, fuch as mortifing the pair of gate-pofts together by crofs pieces of timber under the road; but the moft effectual preventive of the evil appears to be that of letting down the pofts very deep into the ground, which will fuperfede the expence of crofs timbers, and in gaining a firm hold at their bafis, they will be the better fecured both from natural and accidental difplacement. Gate-pofts for common gates fhould be from eight to eight feet and a half in length. See Gate-*Poft.*

Care is alfo to be taken, in hanging a gate, to choofe the beft fide for it to open; in doing which there are two circumftances to be confidered; the principal one is, that there may be plenty of room for a fervant on horfeback to hold the gate while a carriage paffes, and the other is to avoid its opening againft any crofs-road or path, and to which fome attention is due to the trefpafs of cattle from a common

common road or otherwiſe; and it is thought more ſecure for a gate to open againſt that ſide from which the treſpaſs may be moſt apprehended. In ſome caſes, it is adviſable to furniſh a hanging-poſt with a pair of hooks, on both ſides of it, ſo that the gate can be ſhifted as occaſion may make it convenient.

"A key-hole and cotter may be put into the lower hook, to ſecure the gate from being taken off its hinges for idle purpoſes; or a ſtud rivetted to one ſide of either of the hooks, with a little notch cut in the ſtrongeſt part of the adjoining thimble, is a ſimple and good contrivance, whereby a gate is prevented from being taken off the hinges when ſhut; but is eaſily taken off, at ſome one part of its courſe, when required, where the ſtud comes oppoſite to the notch, and admits the thimble to paſs over the ſtudded hook. And it is not uncommon to ſee one hook driven into the poſt with its point upwards in the common way, and the point of the other hook in the contrary direction, which is an effectual mode of keeping the gate on its hinges, but it has the inconvenience of not permitting the gate to be removed without drawing one of the hooks.

"The ſame principles are applied in the hanging of gates on the contrary ſides, and likewiſe to thoſe of ſwing-gates," a full explanation of which may be ſeen in the very uſeful Eſſay referred to, as well as the method of ſawing timber for gates and gate-poſts.

The writer has ſuggeſted "that the common field-gates admit of a material diſtinction from road-gates in ſeveral reſpects; for, as to thoſe, which are uſed very ſeldom, or are generally locked, it is of little conſequence, ſo that the fence is made complete, whether they ſhut of themſelves or not: and ſome people think that a light high gate is preferable to a low and heavier one; but he has heard a gate of about 4½ feet high recommended for ſeveral reaſons, and particularly as a fence againſt horſes; becauſe the top rail would meet their wind-pipes inſtead of their cheſts, and being able to put their heads over it, they would be the leſs likely to force it with their rumps." And that "a gate opening out of a field into a public road, ſhould be ſuch as no one could eaſily get over, with upright pales for inſtance, ſharpened at the top, and it might be higher than uſual: there is no objection to ſuch gates opening double, as folding-doors, and he would prefer the hooks for hanging them to be perpendicular to each other, ſo that the gates ſhould remain wherever they might be placed; and no other faſtening ought to be allowed but a lock and key: this ſuppoſes that there is no common road or path through the field." But, "in very heavy lodge-gates, and turnpike-gates, he has ſeen the lower hinge contrived in ſuch a manner as to have a piece of iron let into a ſtone, with the top of the iron rounded and bevelled acutely towards a point, and a ſocket which may be faſtened to the heel of the gate with ſcrew-pins and nuts; and the ſocket is of courſe leſs acute than the bevel to be received, ſo that as little friction as poſſible may be occaſioned in opening the gate by the twiſt of the hinges, which in neither caſe will be perpendicular to each other. The pivot is well protected from rain and dirt in this manner, but he would always prefer the common hooks and thimbles of a proper ſtrength; and if it were thought neceſſary, the gate might be in part ſupported by a ſmall roller or caſter placed under the heel. And he has alſo ſeen the lower hinge of a ſwing-gate formed with four hooks, or pivots, the two middle ones being projected a little further from the hanging-poſts than the others, and the part attached to the gate indented to anſwer the hooks: but the ſame objections apply to this as to thoſe noticed already.

Table.

The Proportion in regard to Hooks and Thimbles, ſuppoſing a Gate to be a right-angled Parallelogram, ſet forth in Inches and twelfth Parts of Inches.

Diſtance from Thimble to Thimble.	"Horizontal Diſtance of Two perpendicular Lines, one falling from each of the Hooks."	Extra Length of lower Thimble.	Diſtance from Thimble to Thimble.	"Horizontal Diſtance of Two perpendicular Lines, one falling from each of the Hooks."	Extra Length of lower Thimble.	Diſtance from Thimble to Thimble.	"Horizontal Diſtance of Two perpendicular Lines, one falling from each of the Hooks."	Extra Length of Lower Thimble.
12	$\frac{4}{12}$	$\frac{7}{12}$	29	$\frac{9}{12}$	1	46	$1\frac{3}{12}$	$1\frac{6}{12}$
13	$\frac{4}{12}$	$\frac{7}{12}$	30	$\frac{10}{12}$	$1\frac{1}{12}$	47	$1\frac{3}{12}$	$1\frac{6}{12}$
14	$\frac{4}{12}$	$\frac{7}{12}$	31	$\frac{10}{12}$	$1\frac{1}{12}$	48	$1\frac{4}{12}$	$1\frac{7}{12}$
15	$\frac{5}{12}$	$\frac{8}{12}$	32	$\frac{10}{12}$	$1\frac{1}{12}$	49	$1\frac{4}{12}$	$1\frac{7}{12}$
16	$\frac{5}{12}$	$\frac{8}{12}$	33	$\frac{11}{12}$	$1\frac{2}{12}$	50	$1\frac{4}{12}$	$1\frac{7}{12}$
17	$\frac{5}{12}$	$\frac{8}{12}$	34	$\frac{11}{12}$	$1\frac{2}{12}$	51	$1\frac{5}{12}$	$1\frac{8}{12}$
18	$\frac{6}{12}$	$\frac{9}{12}$	35	$\frac{11}{12}$	$1\frac{2}{12}$	52	$1\frac{5}{12}$	$1\frac{8}{12}$
19	$\frac{6}{12}$	$\frac{9}{12}$	36	1	$1\frac{3}{12}$	53	$1\frac{5}{12}$	$1\frac{8}{12}$
20	$\frac{6}{12}$	$\frac{9}{12}$	37	1	$1\frac{3}{12}$	54	$1\frac{6}{12}$	$1\frac{9}{12}$
21	$\frac{7}{12}$	$\frac{10}{12}$	38	1	$1\frac{3}{12}$	55	$1\frac{6}{12}$	$1\frac{9}{12}$
22	$\frac{7}{12}$	$\frac{10}{12}$	39	$1\frac{1}{12}$	$1\frac{4}{12}$	56	$1\frac{6}{12}$	$1\frac{9}{12}$
23	$\frac{7}{12}$	$\frac{10}{12}$	40	$1\frac{1}{12}$	$1\frac{4}{12}$	57	$1\frac{7}{12}$	$1\frac{10}{12}$
24	$\frac{8}{12}$	$\frac{11}{12}$	41	$1\frac{1}{12}$	$1\frac{4}{12}$	58	$1\frac{7}{12}$	$1\frac{10}{12}$
25	$\frac{8}{12}$	$\frac{11}{12}$	42	$1\frac{2}{12}$	$1\frac{5}{12}$	59	$1\frac{7}{12}$	$1\frac{10}{12}$
26	$\frac{8}{12}$	$\frac{11}{12}$	43	$1\frac{2}{12}$	$1\frac{5}{12}$	60	$1\frac{8}{12}$	$1\frac{11}{12}$
27	$\frac{9}{12}$	1	44	$1\frac{2}{12}$	$1\frac{5}{12}$	61	$1\frac{8}{12}$	$1\frac{11}{12}$
28	$\frac{9}{12}$	1	45	$1\frac{3}{12}$	$1\frac{6}{12}$	62	$1\frac{8}{12}$	$1\frac{11}{12}$

In order to render theſe principles more evident, Mr. Parker has given the following figure and deſcription of the method of hanging gates: At *fig.* 14. is a ſection of two gate-poſts, with the proper poſition of the hinges of a gate, which is deſigned to open one way, diſplaying the line of faſtening, the line of reſt, and the line of equilibrium; which two laſt lines are in the ſame vertical plane, both with the hooks, and with the centre of the gate's gravitation; and at about 1-16th part of a circle within the line of equilibrium, a ſhort poſt is fixed in, to prevent the gate opening too near upon its equilibrium, and thereby becoming liable to be left open. *Fig.* 15. is the upper thimble for a common

gate,

gate, which is lefs expenfive, but by no means fo good as when the ftrap extends to the whole length of the gate, as defcribed below; this thimble is twifted 1-4th of an inch bearing towards the hanging-poft. *Fig.* 16. is the lower thimble of a gate proportioned to the upper thimble *fig.* 15, as $1\frac{3}{4}$ inch is to 3 inches, in regard to the diftance between their centres and fhoulders refpectively. Thefe thimbles are adapted for a gate whofe hinges are 40 inches afunder, and as 40 is to $1\frac{1}{4}$, the difference in this inftance, fo fhould be any other diftance from hinge to hinge, to the proportionate difference or extra length of the lower thimble; and the greater the extra length might be made, over and above fuch proportion, the greater muft become the velocity of the gate's fall, or tendency towards the line of reft; until its courfe is arrefted by the faftening-poft 1-16th part of the circle, or 22° 30′ fhort of the line of reft. The lower thimble is let into the gate by a fcrew of equal fubftance throughout its length, or not tapered, in order that the adjuftment of the thimbles, as to the velocity of the gate's fall, may be regulated to fo great a nicety as half a turn of the fcrew: and the thimble may either be let into the heel of the gate, or lengthened out by a wafher, as occafion fhall require. The pofition of the thimbles, in refpect to each other, muft be favoured alfo by the lower thimble, which being placed 1-4th of an inch out of the middle of the heel of the gate, in the contrary direction of the upper thimble, the whole difference, as to the diftances of the two thimbles from the hanging-poft, will be one-half of an inch; and their vertical plane, which is the fame as that of the lines of reft and equilibrium, will form an angle with the line of faftening of 22° 30′, or 1-16th part of a circle; this adjuftment, in effect, adds 1-12th of an inch to the extra length of the lower thimble, fo that, by a plumb-line, it will be found (when the gate is hung upright, as it always ought to be) that the actual extra length of the lower thimble, or horizontal diftance of the two centres from each other, will be $1\frac{1}{4} + \frac{1}{12} = 1\frac{1}{3}$ inch. *Fig.* 17. is the upper hook. *Fig.* 18. is the lower hook, with key-hole and cotter, and is half an inch longer from its centre to the fhoulder than the upper hook, in order to anfwer the thimbles; the actual pofition of the hooks, with refpect to each other, or rather the horizontal diftance of two perpendicular lines, one falling from the centre of each of the hooks, will be about $1\frac{1}{4}$ of an inch only; for if the hooks and thimbles are made to fit properly, each hook will then be more than 1-16th part of an inch fmaller than its thimble; for as the whole lofs in hanging a gate need not be fo much as 1-8th of an inch, or not more perhaps than 1-12th (which exactly balances what is gained in the thimbles), the extra length of the lower thimble before it is fixed to the gate, and that of the lower hook before it is driven into the poft, ought precifely to accord with the dimenfions expreffed in the plate, fuppofing the diftance of the two hinges to be 40 inches." And it is added, that "the diameter of the hooks fhould be about 13-16ths of an inch, and the perforated parts of the thimbles, when made to fit fuch hooks, will be about 14-16ths, that is, 7-8ths of an inch diameter: for pivots of this fize, the above calculations are fuited, as to the velocity of a gate's fall; and the thimbles fhould be made of rounded iron, that the friction may be reduced by the fmallnefs of the furface to be affected thereby: as is fhewn by Mr. Vince's experiments "On the Motion of Bodies affected by Friction." Vol. LXXV. Philofophical Tranfactions of the Royal Society of London. And when old iron-work is made ufe of, wherein a larger furface is expofed to friction, 1-8th, or 1-4th of an inch, as may be fufficient, added to the common extra length of the lower thimble, will be the readieft means of counteracting the extra friction." But, "if the heel of a gate be not at right angles with the rail, or the perforated parts of the thimbles be greater than the proportion allowed for, the deficiency, in either or both cafes, muft be fupplied by adding to the length of the lower thimble.

"A complete gate for opening one way, and conftructed in fuch a manner, that it fhall not fink at the head, as ordinary gates are apt to do, is fhewn at *fig.* 6. The bars are let into the middle parts of the head and heel, and the lacings are tapered for finifhing upon a level furface with the heel, head, and rail; as is evident in the following directions for the fawing out the timber, which fhould be of *kind* oak, not too *tough*, and entirely free from fap." But "the wafte in planing and finifhing a gate may be allowed for or not, as the gate is defired to be a little more or lefs ftrong." But, "when the timber is good, it is reduced fo little by being planed and finifhed into a gate, that no allowance need be made for the wafte; or, at all events, if the fawyer attends to the dimenfions recommended, the gate will be quite ftrong enough for its fize."

Parts of Gate.	Length.		Greateft Thicknefs.	Tapered to.
	Feet.	In.	In. by In.	In. by In.
Heel - -	4	4	$4\frac{1}{2}$—$3\frac{1}{2}$	
Head - -	4	4	$2\frac{1}{2}$—$2\frac{1}{2}$	
Rail - -	9	0	$3\frac{1}{2}$—$3\frac{1}{2}$	$2\frac{1}{2}$—$2\frac{1}{2}$
5 Bars - -	9	0	$3\frac{1}{2}$—1	$2\frac{1}{2}$—$\frac{3}{4}$
Diagonal lacing -	9	6	$3\frac{1}{2}$—$1\frac{1}{2}$	$2\frac{1}{2}$—1
Larger upright lacing	2	8	$3\frac{1}{4}$—$1\frac{1}{4}$	
Smaller ditto -	2	8	3—$1\frac{1}{4}$	

which will be found to form a well proportioned gate, the whole of the eight parts at the head prefenting to the eye $2\frac{1}{2}$ inches, and feven out of the eight parts at the heel, that is, all excepting the heel itfelf, prefent $3\frac{1}{2}$ inches." And in it "the diagonal lacing is fitted into the heel by a ftrong butment, even with the loweft bar, and its fmaller end meets the upper angle at the head, and is confined laterally by two upright lacings; this would keep up the rail, provided the head were not pufhed forward, and that is prevented by an iron ftrap of equal length to the gate, being attached to, or forming a part of the upper thimble in the firft inftance, where it holds the heel of the gate by the fhoulder of the thimble; it is afterwards fcrewed to the rail at proper diftances; and laftly, fecures the whole work together, by a fcrew-nut, rounded and let into the front of the gate's head, as feen above. The iron ftrap is about an inch by a quarter of an inch in fubftance, for one half of its length, when it is tapered towards the head of the gate. At the end neareft to the thimble it is made ftronger for a few inches; and clofe to the fhoulder of the thimble, it fhould be as much as half of an inch thick; the edges are chamfered off, and the whole appears to be gradually tapered from the heel to the head of the gate, widening a little round the hole which is left for the upright part of the latch adjoining to the handle. By this arrangement, the gate is in fact fufpended by the iron ftrap and rail, inftead of the heel, which affifts greatly in preventing any ftrain upon the mortifes by the gate's own weight, or otherwife." The writer fays, he "cannot imagine a gate of a more durable conftruction, and that it feems particularly well calculated for *road-gates*. As in refpect to a field, through which there is no common road, it is immaterial what fort of gates may be ufed, fo that they be made fecure againft cattle."

 In

In respect to the fastening it is observed by the same writer, that most blacksmiths have favourite notions of these fastenings, and that from their great variety, it is only necessary to consider such as have been found useful on trial. The fastening, shewn at *fig.* 19, "is remarkably easy for a horseman to open, and as difficult, if not impossible, to be opened by cattle: the upright wire of the latch is furnished with a guard, and the mortise of the head of the gate, through which the latch passes, is finished with sheet-iron escutcheons, like those seen at *fig.* 22, the fastening being completed with the catch 21, having a button in the place of the ring. *Fig.* 20. is a common peg-latch for the head of a gate, with a guard to render it safer for cattle, which might run against it when the gate is open; and this forms a very secure fastening, either with or without the guard, when attached to the catch, *fig.* 21; but it is thought very inconvenient for horsemen, and particularly so for those who are not accustomed to it. *Fig.* 21. is the catch adapted to the latch, *fig.* 22. *Fig.* 22. represents two sheet-iron escutcheons, and a pattern for a strong latch, which is executed in cast-iron 3-4ths of an inch thick. *Fig.* 23. is the catch belonging to *fig.* 19, to be made also of cast-iron, 1 inch thick. *Fig.* 24. is a hasp with a peg, of which the stud passes through the lower hole, but is too large to pass the upper hole, and therefore cannot be detached from the hasp: this may be made very useful in the fold-yard, &c."

The author states, that "the double drop catch, *fig.* 25, has been used for some time in parts of Shropshire and Staffordshire, and that he took no small pains to improve it: he adapted it for fitting an angle of a post, of which *fig.* 26 is an horizontal section, and the screw-pin in the centre is made to answer two purposes: that of attaching the iron work more firmly to the post, and also of returning the points of the drop catches as often as either of them is driven upwards by the latch, the catch being thus instantly repulsed into its former position, before the gate has time to recoil beyond it." It is supposed, that this "sort of catch is calculated for a swing-gate, which, having been opened either way, falls to its line of rest, but is prevented from passing it by the obstruction of one of the catches; while the other catch giving way for the latch, drops again, and the gate is completely fastened." And he "afterwards applied the same principle to a single catch, for a gate to open only one way, *fig.* 27, in which he conceived that he had been very successful.

"It was next to be determined what kind of latch was most proper for these catches, and he found that the best contrivances for baffling cattle were apt to puzzle his visitors, whose convenience was entitled to a share of his attention." He "at first tried an iron peg, *fig.* 28, to be driven into the head, opposite the top rail, for a road-gate, and when it was to be placed lower for a fold-yard, or common field-gate, to be fastened with a screw-nut, both of which are represented in the figure. He then found it necessary to add a handle to the drop, *fig.* 27, but his friends would still insist upon it that it was a two-handed fastening, and very inconvenient for horsemen; he therefore soon discontinued the iron peg, in regard to the double catch, though he approves of it for some purposes." He thinks "it certainly never can be opened by cattle, and it would be easy enough for a horseman to open, when he became acquainted with it; yet should he take fast hold of the handle of the catch with the fore part of the hand, as might be expected, in raising the drop, he will detach that hand from the gate, and he must then seek the aid of his other; though by placing the thumb or palm of the hand upon the drop-catch, and reserving the full liberty of his fingers, he may open the gate very well with one hand; but when the catch is upon the contrary side of the gate to that of the horseman, it will not be quite so convenient, for the fingers or fore-part of the hand must in that case be employed upon the catch, while the thumb opens the gate. A great advantage may be gained by having the iron peg guarded, as represented at *figs.* 29 and 30, which will remove the objection to its being in any way dangerous; and while it facilitates the opening of the gate with one hand, it throws a fresh difficulty in the way of cattle."

But "the iron-peg latch would not, however, answer for the swing-gate, and he has supplied its place by the jointed latch A, in *fig.* 6, the principle of which is not uncommon; the part O forms a most complete guard to the latch, and the handle, being a semicircular ring, rests upon the upper bar of the gate, or upon the second bar, making it extremely improbable that a cow or horse could ever lift up a latch of this kind." But that "for a swing-gate the latch should be placed as nearly as possible to the middle part of the head, that the gate may the better resist the jar of its shutting; for the sudden check which the drop-catches give to a swing-gate, is greater than what is found in ordinary fastenings; and if the latch were placed towards the top of the head of the gate, it would be as destructive as the common manner of hanging single gates."

After "having finished his drop-catches, a friend assured him, that he had seen both single and double catches in Suffolk upon the same principle, and at his request he procured him a very good sketch of them, and also a sort of model: as far as he could judge from the drawings of the Suffolk catches, they seemed rather to have the advantage of those which he had first seen in Shropshire." But, "in the course of an extensive tour he made, he took occasion to observe, that however generally good methods of hanging and fastening gates might be understood, they were very rarely practised; and he cannot help particularly noticing the gates across the public roads in Dorsetshire, which are very numerous, in support of his assertion: and should these hints ever find their way so far, he hopes that public as well as private convenience, in such respect, may thereby be promoted. He saw a catch, similar to *fig.* 31, in Devonshire, and the latch used with it was a kind of iron peg nailed to the inner side of the top rail of the gate; but there is an objection, he thinks, to any catch receiving the latch above the pivot upon which the catch turns: such a fastening, if the gate sinks but very little, will gradually become useless, which gives an undoubted preference to the other drop-catches; as with them a gate must sink two inches (which one that is well hung never ought to do) before the catch will cease to act.

"It is very material, he thinks, that the iron peg should not rest close against the gate-post, as that would very much increase the difficulty complained of in opening a gate with these fastenings; the middle part of the head of the gate, as to its thickness, is the fittest to receive the iron peg, whether it is to be placed high or low, and the play of the catch will be the same in all instances, provided its shouldering is adapted accordingly."

The writer states that "the double catch, *fig.* 32, is used at this time in several parts of Shropshire, with the latch adjoining it made to rise upon a pivot. The hollow part of the latch is in shape and size like a table-spoon, with a hole drilled through it to prevent rain lodging there; a swing-gate with this fastening is opened either by the hand pressing down the hollow part of the latch, or on horseback you may put a stick, or the butt end of a whip into it, and with only one exertion the gate may be thrown open: on the

the return of the gate, the latch ſtrikes againſt the lower part of one of the catches, either of which will riſe upon its reſpective pivot, till obſtructed by an iron pin or ſtud, placed near the centre of the iron-work. Theſe drop-catches are thinner at their upper parts than they are downwards, which aſſiſts the latch in riſing clear of them; and when the gate is faſtened, the latch is at reſt between the two drop-catches. This is not a very eaſy faſtening to deſcribe, and might be proper to be more particular were it not for the preference due to other contrivances." He ſtates further, that "a guard muſt be adapted for ſuch a latch, or cattle would be likely to open it; but this faſtening is particularly liable to be out of order, either by the ſinking or the contraction of the gate: every objection might be more eaſily removed than the effects of the gate's ſinking, and to this he has made a ſlight improvement, as in the figure; that is, when the latch has ſunk lower than the catches, it will ſtrike againſt an inclined plane, and have a chance of riſing upon its pivot to overcome the obſtacle. But he has lately, he ſays, received a catch for a gate from Leiceſterſhire, which, though it poſſeſſes a great likeneſs to that at *fig.* 27, has one material advantage; that is, that it confines the latch when the gate is at reſt, by a full inch and a half within a narrower compaſs, or allows it ſo much leſs play, which was very deſirable. This pattern of a ſingle catch admitted of a ſmall improvement, and it was eaſily adapted alſo to a double catch: with reſpect to their uſe, what has been ſaid in regard to that at *fig.* 27, and thoſe at *figs.* 25 and 26, will properly apply to theſe catches. The ſingle catch is repreſented at *fig.* 33, and the double catches at *figs.* 34 and 35, which are entitled to a moſt decided preference, compared with any that he has ever met with. Beſides, the handle of the ſingle catch riſes almoſt perpendicularly, and therefore does not interfere with the hand in performing its double office of opening the gate, and holding up the catch at the ſame inſtant: whereas the handle of the catch, *fig.* 27, muſt be brought much forwarder in lifting it up than that of the catch *fig.* 33, and this, added to the difference in the play of the gate, will make altogether about three inches, which is a great deal in the ſpan of a hand." But, he obſerves, that "there is an objection which attaches equally to theſe kinds of catches, as to others, that they may eaſily be broken off a poſt, and carried away; and to obviate this, he confeſſes himſelf incompetent to adviſe any certain mode of ſecuring them; but he ſubmits that where ſuch depredations have been experienced, there will ingenuity moſt likely be found to counteract them." The writer concludes by obſerving, that "there are many inventions of ſpring catches and latches, the common ſorts of which are very liable to be out of repair, by being conſtantly expoſed to the weather, and that thoſe of a ſuperior kind are too expenſive for general purpoſes."

It may be uſeful to inſert, among theſe different ſorts of faſtenings, the repreſentation of a convenient mode of confining horſes to their ſituations in ſtable-yards or other places. This is ſeen at *fig.* 36, in the plate, and conſiſts of a hook and ring, by which they can be held by the halter or bridle, and which, though commonly known and employed in many places, cannot be too ſtrongly recommended: a ſtable-yard ſhould always be well furniſhed with ſuch hooks, to prevent the uſe of common nails, which are extremely dangerous; and one of them may occaſionally become an uſeful appendage to a gate or wicket.

There is alſo a haſp, ſuch as that ſeen at *fig.* 37, with a hook rivetted to it, that may be found uſeful for fold-yard gates, pig-ſties, dog-kennels, and other places of a ſimilar kind.

GATES, *Caſt-iron Hangings and Faſtenings for.*—The introduction of caſt-iron hinges and faſtenings for gates has been attempted, and not without ſucceſs, by Mr. Parker, by which the expence in ſuch caſes is greatly leſſened, and at the ſame time the durability of the articles vaſtly increaſed. It is remarked by him, "that not a ſingle inſtance of failure has come within his knowledge in this ſort of iron-work for gates," though it "has been purpoſely ſubmitted to the moſt ſevere teſts; and he has little doubt but that in reaſonable time the improvement will be generally adopted." It has, indeed, been found that faſtenings of this ſort are capable of reſiſting the ſtrongeſt horſe purpoſely rode againſt the gate; and the ſtouteſt man may throw the gate towards its falling-poſt with all his power, without injury to the caſt hangings. And further, that the ſaving to the public by the adopting of caſt iron, in compariſon with the beſt wrought iron work is, it is ſuppoſed, apparently more than ſixty, but in reality not leſs than fifty *per cent.* It is obſerved that the different patterns have been executed with great correctneſs, in fine mahogany, to the perfect ſatisfaction of the inventor, and that the caſtings are conſequently the ſame. It was therefore only neceſſary for their ſtrength to be fully demonſtrated; and that, this having been done, his deſign is completed. But ſhould the caſt iron-work in any caſe happen to be furniſhed from the foundery without being accurately fitted, it may be adjuſted by filing with the ſame facility that wrought iron work can be altered, or at leaſt with very little more difficulty.

The public have been undertaken to be ſerved with proper ſupplies of theſe caſt-iron hangings and faſtenings, by Meſſrs. Deerman, Francis, & Co. Eagle Foundery, Birmingham; the caſtings being completely finiſhed and fitted at the charge of $3\frac{3}{4}$*d.* the pound. The quantity of two tons has been directed to be caſt without delay, and ſeveral hundred weights of caſtings already brought into uſe under the immediate advice of the inventor.

The following hints, or memoranda, are furniſhed with the view of affording a diſtinct method of giving orders for the caſt-iron work to thoſe gentlemen or other perſons who may wiſh to make a trial of it.

For the gate ſhewn at *fig.* 6, to which a head-ſtrap and ſtrap-thimble are adapted, of caſt iron, omitting the intermediate length of the nine-feet iron ſtrap, the directions may be for Mr. Parker's patterns, Nos. 1, 3, 4, 6, 7, 8, and 9, (the caſtings being emboſſed with numbers from 1 to 16), $17\frac{1}{4}$*lb.*, 5*s.* $7\frac{3}{4}$*d.*; a pair of ſheet-iron eſcutcheons, 2*d.*; No. 9 is the jointed latch formed in three pieces: 12 two-inch wood ſcrews, 4 one and a half inch ditto, and 16 two-penny clout-nails are likewiſe neceſſary to complete the whole.

But for a common ready made gate, having a ſtrong top-rail for the ſtrap-thimble, Nos. 1, 3, 4, 5, 6, and 7, 15*lb.* 4*s.* $8\frac{1}{4}$*d.* are only required; with 12 two-inch ſcrews, and two one and a half inch ditto. And for a common gate, not having a ſtrong top-rail for the ſtrap-thimble, Nos. 1, 2, 3, 4, 5, and 6, 13*lb.* 4*s.* $0\frac{3}{4}$*d.*, are merely requiſite. The coſt of a complete ſet of ſpecimens, being ſixteen in number, which forms ſets for every purpoſe, including ſwing-gates, 41*lb.*, is 12*s.* $9\frac{3}{4}$*d.*

It is ſtated, in addition, that the ſhapes of the ſeveral pieces of caſt-iron work will point out the manner in which they are reſpectively to be attached to the gates in ordinary caſes.

GATE, in *Engineery*, is applied to the cloſe-boarded doors of locks or ſluices on canals or rivers, for penning the water: in a lock theſe are diſtinguiſhed by upper-gates and lower-gates, according as they are placed at the head or tail of the lock. See CANAL.

GATE,

Gate, or *Gait*, in the *Manege*, called in French *train*, is ufed for the going or pace of a horfe.

Gate, in a *Military Senfe*, is made of ftrong planks, with iron bars, to oppofe an enemy. They are generally made in the middle of the curtin, from whence they are feen, and defended by the two flanks of the baftion. They fhould be covered with a good ravelin, that they may not be feen or enfiladed by the enemy. Thefe gates, belonging to a fortified place, are paffages through the rampart, which may be fhut or opened by means of doors and a portcullis. They are either private or public.

Private gates are thofe paffages by which the troops can go out of the town unfeen by the enemy, when they pafs to and from the relief of the duty in the outworks, or on any other occafion which is to be concealed from the befiegers.

Public gates are thofe paffages through the middle of fuch curtins, to which the great roads or public ways lead. The dimenfions of thefe are ufually about thirteen or fourteen feet high, and nine or ten feet wide, continued through the rampart, with proper receffes for foot paffengers to ftand in out of the way of wheel-carriages. The front of the gate-way on the outfide is commonly ornamented with architecture either of the Tufcan or Doric order: and over the vault, which covers the paffage, clofe to the town wall, is erected a building of about eighteen or twenty feet fquare, in which the portcullis is fufpended; and on the infide of the rampart there is generally another building, of about a hundred feet in front, and thirty deep, and high enough to contain one or two floors of rooms for one of the town officers; the ground floor ferving for guard-rooms for the troops on duty at the gate. See Harrow, Herse, Organ, and Portcullis.

Gate, in *Mining*, fignifies a paffage or gangway underground, ufed by the minors. Drift, audit, gallery, augle, tunnel, brough, fough, &c. are words of nearly fimilar import.

Gate, *Poftern*. See Sally-*port*.

Gate *of the Sea*, or a *Sea-gate*, is ufed when two fhips lie aboard one another in a wave or billow, and by that means fometimes become rib-broken.

Gate, in *Scripture Language*, is ufed to denote the place of public affemblies, where juftice was adminiftered. (Deut. xvii. 5, 8. xxv. 6, 7. xxi. 18, 19. xxii. 15, &c.) As the Jews moftly laboured in the fields, affemblies were held at the city-gates, and juftice was adminiftered there, that labourers, who ought to follow their work, might lofe no time, and that the country people, who required juftice, might not be obliged to enter the town. Accordingly, the lower courts of juftice, in the feveral cities, were held in their gates: thus we read, "judges and officers fhalt thou make in all thy gates." (Deut. xvi. 18.) So that the gate among the Hebrews feems to have correfponded to the "forum" among the Romans, and to the αγορα among the Greeks; which was the name given to any common place of refort, whether for the keeping of markets, or the holding courts of judicature. In the former fenfe, the word, gate, is ufed, when Elifha foretells at what low rate provifions would be fold, on the morrow, in the gate of Samaria. (2 Kings, vii. 1) In the latter fenfe, Ifrael is exhorted to "execute the judgment of truth and peace in her gates." (Zech. viii. 16.) In either fenfe, that is, as denoting, in general, a place of public concourfe, the word is ufed, when it is faid of the virtuous woman, "Give her of the fruit of her hands, and let her own works praife her in the gates." Prov. xxxi. 31.

Hence *gate, porta*, fometimes fignifies power and dominion: and in a fimilar fenfe the Turkifh emperor's palace is called the *Porte*. Thus, God promifes Abraham, that his pofterity fhall poffefs the gates of their enemies, their towns and fortreffes. (Gen. xxii. 17.) Our Saviour fays to Peter, "Thou art Peter, and upon this rock will I build my church, and the gates of hell, or Ades, fhall not prevail againft it." Matt. xvi. 18. See alfo Ifaiah, xxxviii. 10. Pf. ix. 13. cvii. 18. See Ades.

Gates, *Opening of*, in *Aftrology*. See Opening.

GATEHOUSE *of Fleet*, in *Geography*, a town of Scotland, in the county of Kircudbright, fituated near the mouth of the Fleet, not far from the Irifh fea, with a cotton manufacture. Sloops come near the town; 13 miles W. of Kircudbright.

GATEL, a town on the eaft coaft of Mindanao. N. lat. 7° 52'. E. long. 126° 18'.

GATERINA, in *Ornithology*, a fpecies of *Sciæna*; which fee.

GATES, in *Geography*, a county of America, in Edinton eaftern diftrict, North Carolina, bounded north by the ftate of Virginia, and fouth by Chowan county. It contains 5881 inhabitants, including 2688 flaves; 280 miles from Wafhington. The chief town is Hertford.

GATESHEAD, a borough and parifh in the ward of Chefter, and county palatine of Durham, England. The town is built on the fide of a hill, which flopes to the north, where it is bounded by the river Tyne; over which is a ftone bridge, with an iron gate in the centre, feparating the refpective boundaries and jurifdiction of Gatefhead and Newcaftle. By a charter granted by bifhop Pudfey in 1164 to "his burgeffes of Gatefhead," it is provided, that "each fhall have, in right of his burgage, fimilar liberties to thofe enjoyed by the burgeffes of Newcaftle, in right of their burgages; and that they fhall have free paffage within the liberties of the palatinate with their goods, clear of all dues and exactions." Several fucceeding prelates had their keepers of the park and caftle here. In 1557, bifhop Tunftall granted a charter to the company of Glovers, within the borough of Gatefhead; in 1602, bifhop Matthew incorporated fundry trades; and in 1661, bifhop Cofin conftituted them one commonalty. In the reign of Edward VI. this borough was united to Newcaftle; but in the fucceeding reign it was reftored to the fee of Durham, &c. Previous to the former event, it appears, from "Strype's Annals," that the mayor and burgeffes of the latter place purchafed from Thomas Sutton, founder of the Charter-houfe in London, for 12,000*l*. "the manor of Gatefhead, with all the manors, coal-pits, and coal-mines in Gatefhead and Wickham, with the common waftes, &c." The trade of this place is not very extenfive: it, however, poffeffes feveral manufactories, particularly of caft and wrought iron, whiting, &c. The population was ftated in the late returns at 8597, inhabiting 1101 houfes.

On the eaft fide of the chief ftreet, about half a mile from the bridge, are the ruins of St. Edmund's hofpital, or monaftery, fuppofed to occupy the fcite of a monaftery which appears, from Bede, to have been eftablifhed previous to the year 653.

On Gatefhead Fell, a bleak and elevated ridge, extending fouthward from the village, a victory was obtained, in the year 1068, by William the Conqueror, over the combined forces of Edgar Atheling, and Malcolm, king of Scotland. Brand's Hiftory of Newcaftle, 2 vols. 4to.

GATEWAY, in *Rural Economy*, a paffage, or opening into an inclofure, which is ufually clofed by a gate. The fpace for a gateway fhould be from eight to nine feet, in general; but a greater width is, in fome cafes, requifite. The

The foundations of gateways ſhould always be well laid with ſome ſolid material of the ſtone kind.

GATH, in *Ancient Geography*, a city of the Philiſtines, one of their five ſatrapies, or principalities, (1 Sam. vi. 17.) which were ſituated along the Mediterranean coaſt, between that and the tribes of Simeon, Dan, and part of Benjamin, extending from the ſea-port of Jamnia to the mouth of the river Bezor. Gath, or Geth, was famous as the birth-place of Goliath; it was firſt conquered by David, (1 Sam. xvii. 4.) and continued ſubject to his ſucceſſors till the declenſion of the kingdom of Judah. (2 Sam. viii. 1.) It was rebuilt and fortified by Rehoboam (2 Chron. xi. 8.): and retaken by Uzziah and Hezekiah. It was ſituated about five or ſix miles S. of Jamnia, about 14 S. of Joppa, and 32 W. of Jeruſalem. Gath was the moſt ſouthern city of the Philiſtines, as Ekron, or Accaron, was the moſt northern; ſo that Ekron and Gath are placed as the boundaries of their land. (1 Sam. vii. 1. 4. xvii. 52.) Jerom places Gath on the road from Eleutheropolis to Gaza. It recovered its liberty and luſtre, ſo as to be a place of ſtrength, in the time of the prophets Amos and Micah, independent of the kings of Judah (Amos, vi. 2. Micah, i. 20, &c.); but it was afterwards demoliſhed by Hazael, king of Syria. After that period, it remained of little conſideration till the time of the holy war, when Fulk, king of Jeruſalem, built a caſtle on its ruins.

GATH-*Opher*, or GATH-*Epher*, a town in the diſtrict of Opher, in Galilee, the birth-place of the prophet Jonah (2 Kings, xiv. 25.); placed by Joſhua (xix. 13.) in Zebulun. Jerom, in his preface on Jonah, ſays, that it was two miles from Sephoris, or Diocæſarea.

GATH-*Rimmon*, a city belonging to Dan (Joſh. xix. 45.); placed by Jerom 10 miles from Dioſpolis, towards Eleutheropolis: it was given to the Korathites.—Alſo, a city in the half-tribe of Manaſſeh, on this ſide of Jordan; given to the Korathites. (Joſh. xxi. 25.)—Alſo, a city of Ephraim; given to the Korathites. 1 Chron. vi. 69.

GATHEÆ, a town of the Peloponneſus, in Arcadia, according to Pauſanias.

GATHEATES, a ſmall river of Arcadia, in the ſouthern part, which ran from ſouth to north, and having received the Carnion, diſcharged itſelf into the Alpheus, over-againſt Megalopolis.

GATHER, in the *Sea Language*. A ſhip is ſaid to gather on another, when ſhe gets the wind of her.

GATHERING, in *Rural Economy*, is a term applied to the proceſs of rolling corn-ſwaths into a kind of cocks, or heaps. It alſo ſignifies a particular method of ploughing. See PLOUGHING.

GATINGOLY, in *Geography*, a town on the eaſt coaſt of Celebes. N. lat. 0° 22′. E. long. 123° 46′.

GATINOIS, or GASTINOIS, a province of France before the revolution. In the 11th century it had courts of its own, and was afterwards joined to Anjou. In later times it has partly belonged to the government of Orleans, and partly to the government of the iſle of France, and was diſtinguiſhed by the names of "Gatinois Orleanois," and "Gatinois François." It now forms part of the departments of the Seine and Marne, Seine and Oiſe, and Loiret.

GATO, a ſmall iſland in the Eaſt Indian ſea; 12 miles N. of Sibu. N. lat. 11° 42′. E. long. 123° 36′.

GATRON, or KATTRON, a town of Africa, in Fezzan; 40 miles S. of Mourzouk.

GATSCH, a town and caſtle of Hungary; 12 miles E. of Korpona.

GATSEELA, a town of Bengal; 46 miles W. of Midnapour.

GATT, a ſtrait between the Friſch Haff and the German ſea.

GATTAIR, in *Ornithology*, a ſpecies of *Anas*. See DUCK.

GATTAN, in *Geography*, a town of Hindooſtan, in Allahabad; 10 miles north of Jionpour.

GATTAR, or KATTAR, a ſea-port of Arabia, in the province of Lachſa, on the Perſian gulf, oppoſite to Bahhrein; 40 miles S. of El-Catif.

GATTINARO, a town of France, in the department of the Seſia, on the Seſia; 15 miles N. of Vercelli.

GATTO, CAPE, or *Cape Gata*, a cape on the S. coaſt of the iſland of Cyprus, probably the "promontorium phrurium" of the ancients. The land is low, the north and weſt parts of it being a moraſs, and on the eaſt ſide is a large ſalt lake, which is filled by the rains in winter, and is almoſt dry in ſummer. The ſouth part is a barren rocky ſoil, on which is a ruinous uninhabited convent, called "St. Nicholas." N. lat. 34° 32′. E. long. 33° 8′.

GATTON. See AGATTON.

GATTON, a borough town in the county of Surry, England, has been formerly a place of ſome extent and conſequence; but is reduced to 18 houſes, and 112 inhabitants. A privileged few of theſe, about ſeven, ſend two members to parliament. This place, "like its neighbours Rhiegate and Blechingley," ſays Mr. Gough, "owes its ruin to the *honor* of being repreſented in parliament. It had once a caſtle, ſucceeded by the manor-houſe." This is a modern edifice, ſeated in a fine park, which abounds with plantations, and is ornamented with a lake of about forty acres. The river Mole riſes in this pariſh.

GATTORUGINE, in *Ichthyology*, a ſpecies of *Blennius*, with palmated ſmall fins at the eye-brows and nape; or, as Artedi deſcribes it, with two ſmall fins at the eyes, and the anal fin conſiſting of 23 ſmall bones. It inhabits the Mediterranean and Atlantic ſeas. Pennant deſcribes a fiſh of this ſpecies, which was found on the Angleſea coaſt. Its length was $7\frac{1}{2}$ inches; the body ſmooth and compreſſed on the ſides; the belly a little prominent, and the vent, like that of the creſted blenny, or "galerita," placed under the ends of the pectoral fins. The teeth ſlender, almoſt ſetaceous and very cloſe-ſet; between the eyes was a ſmall hollow, and above each, juſt on the ſummit, was a narrow looſe membrane, trifurcated at the top, which diſtinguiſhes this from all other ſpecies. The pectoral fins broad and rounded, conſiſting of 14 rays; the ventral fins like thoſe of others of the genus; the dorſal fin conſiſting of 14 ſtrong ſpiny rays, and 19 ſoft rays; the anal fin having 21 rays; the tail rounded at the end, and conſiſting of 12 rays, divided towards their extremities. This fiſh in general was of a duſky hue, marked acroſs with wavy lines; the belly of a light aſh-colour; the lower part of the pectoral fins, and the ends of the ventral fins, of an orange colour.

GAU, GAW, *Gou*, or *Gow*, a termination in the German language, ſignifying country, canton, or diſtrict.

GAU *Scherkie*, in *Geography*, a town of Egypt, on the right bank of the Nile, oppoſite to Tahta, ſuppoſed by Norden to be the ancient Dioſpolis. In this town is a temple, 60 paces in length and 40 in breadth, ſeemingly covered by a ſingle ſtone reſting upon columns. The roof is well preſerved; and it is uſed by the Arabs as a lodgment for their cattle.

GAVALI, in the *Materia Medica*, a name given by ſome of the old writers to bdellium, particularly to the Arabian kind, which was the pureſt, and was uſually in form of ſmall tears, and of a pale yellowiſh colour.

GAVALS,

GAVALS, in *Geography*, a town of Ruſſia, in the government of Wiburg; 28 miles S. of it.

GAVAREEA, Cape, a cape on the eaſt coaſt of Kamtſchatka. N. lat. 52° 4′. E. long. 158 31′.

GAUBIL, Anthony, in *Biography*, was born at Caillac in 1708, and was educated among the Jeſuits, into whoſe order he entered. By them he was ſent a miſſionary to China, where he paſſed thirty-ſix years, during which he obtained a knowledge of the Chineſe hiſtory and literature, which ſurprized the learned natives themſelves. He publiſhed ſeveral hiſtorical works, which were chiefly tranſlations from the Chineſe language. He died in 1759, having done much in ſupporting, by his aſtronomical knowledge, and general ſcience, that reſpectability which the Jeſuits had maintained above all other learned European orders. Nouv. Dict. Hiſt.

GAUBIUS, Jerome David, was a pupil of the learned Boerhaave, and became himſelf a profeſſor of medicine in the univerſity of Leyden, where he took the degree of doctor in 1725. He left ſeveral works of conſiderable value, which would not have diſcredited his maſter.—1. "Diſſertatio Inauguralis de ſolidis humani corporis partibus," Leyden, 1725.—2. "Libellus de methodo concinnandi formulas medicamentorum," ibidem, 1739, 1767. Franckfort, 1750, and in French, Paris, 1749.—3. "De regimine Mentis, quod Medicorum eſt," Leyden, 1747, 1763. In this work he deſcribes the effects reſulting from the empire of the body over the mind.—4. "Inſtitutiones Pathologiæ Medicinalis," ibid. 1758. This work alſo paſſed through ſeveral editions and tranſlations.—5. "Adverſariorum varii argumenti Liber unus," ibid. 1771. Eloy.

GAUDEN, or Gawding, John, in *Biography*, an Engliſh prelate, was born in the year 1605, at Mayland in Eſſex. He received the elementary parts of his education at Bury St. Edmund's, and at the age of fixteen he was ſent to St. John's college, Cambridge. About 1630 he married a daughter of ſir William Ruſſel, and removing to Oxford became a member of Wadham college, where two of his wife's brothers were put under his care, and afterwards ſome other young perſons of conſiderable rank in life. In 1635 he took his degree of bachelor of divinity, and was afterwards appointed chaplain to the earl of Warwick. His patron's politics being in direct oppoſition to thoſe of the court, his chaplain embraced the ſame ſide, and preached a ſermon before the houſe of commons, in November 1640, which was ſo highly approved by that body, that they voted him a preſent of a large ſilver tankard, with an honorary inſcription upon it. In 1641 he took his degree of D. D. and was preſented by the parliament to the deanery of Bocking in Eſſex, which valuable preferment was confirmed to him by archbiſhop Laud, then a priſoner in the Tower. During the civil wars, and when the Preſbyterian form of church government and worſhip were eſtabliſhed, Dr. Gauden conformed, and preſerved his livings; and in 1643, he was appointed one of the "aſſembly of divines," but his name was afterwards ſtruck off the liſt, as he was ſuſpected of an attachment towards epiſcopacy. In 1648, his principles were more openly declared, for when the army had aſſumed the ſovereign power, and were determined to impeach, and bring to trial the unfortunate and miſguided Charles, Dr. Gauden inſiſted upon the unlawfulneſs of ſuch a meaſure, and publiſhed his proteſtation againſt their meaſures, which, as the title of the work imports, he cauſed to be preſented to the lord Fairfax, and his general council of officers. In the ſame year he wrote, but without venturing to publiſh, "a juſt invective againſt thoſe of the army and their abettors who murdered king Charles I.," with ſome poetic pieces in Latin, referring to thoſe tragical times. During the ſame year likewiſe the celebrated treatiſe entitled "Εικων βασιλικη, or portraiture of his ſacred majeſty in his ſolitude and ſufferings" was firſt printed, and in a few months it had paſſed through ſeventeen editions in England. Dr. Gauden, it is generally admitted, had a principal ſhare in this work, if he were not the ſole author, but fortunately the ſuſpicion of it did not light on him till epiſcopacy was re-eſtabliſhed. He was author of ſome other pieces which muſt have been obnoxious to the ruling party, neverthelеſs he continued unmoleſted till monarchy and epiſcopacy were again reſtored, when his zeal was rewarded by preferment in that church, for which, in the times of its affliction, he had been an advocate. He was appointed preacher at the Temple in the year 1659, and in the following year made chaplain to his majeſty Charles II. He now devoted his talents to vindicate the meaſures of the court, and to juſtify the cauſe of the hierarchy againſt ſectaries; and for his various ſervices, of which, it is ſaid, he frequently reminded the king, he was, in 1660, promoted to the vacant ſee of Exeter, which proved a moſt lucrative ſituation; for, from the fines for the renewal of leaſes, which had not been levied during the abolition of epiſcopacy, in a few months he realized the ſum of twenty thouſand pounds. In 1662, he was tranſlated to the ſee of Worceſter, but he had hoped for the more valuable biſhopric of Wincheſter, which was given to Dr. Morley, the late prelate of Worceſter. This diſappointment of his ambition he could not brook, his pride was mortified, he was taken ill very ſoon after his removal to the new ſee, and died in the fifty-ſeventh year of his age. His character has been variouſly eſtimated. Wood ſpeaks of him as "eſteemed by all who knew him, and as one who was much reſorted to, for his admirable way of preaching." Kennet repreſents him as capable of underwork, as a tool to the court, by the moſt ſordid hopes of greater favour in it; and Charles II. is reported to have ſaid, on hearing of his death, "I doubt not it will be eaſy to find a more worthy perſon to fill his place." By others he is repreſented as inconſtant, ambiguous, luke-warm, vain, ambitious, covetous of preferment, and impatient in the purſuit of it. Biog. Brit.

GAUDENS, St., in *Geography*, a town of France, and, principal place of a diſtrict, in the department of the Upper Garonne, ſeated on the Garonne. The place contains 4,055, and the canton 14,943 inhabitants, on a territory of 190 kiliometres, in 22 communes; 44 miles S.S.W. of Toulouſe. N. lat. 43° 6′. E. long. 0° 48′.

GAUDENTIUS, in *Biography*, a ſaint in the Roman calendar, and biſhop of Breſcia, who flouriſhed in the fourth and fifth centuries. He was elected to the ſee of Breſcia in the year 387, which happened during his abſence on a religious viſit to the Eaſt. When he was informed of the choice which had fallen upon him, his diffidence was ſo great that he felt extremely averſe from undertaking ſo weighty a charge, and purpoſely delayed his return to Italy, under the hope that ſome other perſon might be appointed in his ſtead. Deputies were ſent to him to urge his ſpeedy compliance with their wiſhes, and to requeſt of the eaſtern biſhops, that Gaudentius might not be admitted to their communion, if he ſhould refuſe to return to his own dioceſe. Finding them determined upon his acceptance of the new appointment, he returned without farther delay. In 404 he was ſent with a deputation to Conſtantinople, by the emperor Honorius and the weſtern biſhops, to appeaſe the emperor Arcadius's reſentment againſt St. Chryſoſtom, and to intercede for his peaceable re-eſtabliſhment in the ſee. It

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is not known how long this bifhop lived; fome biographers mention his death as having happened in 410, and others in 427. He was author of feveral works, and of letters and other pieces, which are inferted in the fifth volume of the "Bibliotheca Patrum." The moft complete edition of his works was publifhed at Brefcia in the year 1738, with thofe of Philafter, the life of whom has been attributed to Gaudentius. His ftyle is plain, but defective in the ftrength, eloquence, beauty, and correctnefs which diftinguifh the writings of many of his contemporaries. Moreri. Gen. Biog.

Gaudentius *the Philofopher*, one of the feven Greek writers on mufic, collected and publifhed by Meibomius 1652, with a Latin tranflation and commentary. We can find no very fatisfactory information concerning this writer's country, or the time when he flourifhed. Fabricius, Bibl. Græc. lib. iii. cap. x. feems to think that he preceded Ptolemy; but being a follower of the doctrines of Ariftoxenus, he compofed an introduction to harmonics, which Caffiodorus has twice celebrated as an elegant little work; though he neither tells us when nor where he lived. However, on his authority, Caffiodorus relates, that Pythagoras difcovered the original precepts of the art, by the beating of hammers, and the percuffion of tuneful founds; and concerning this tradition, Gaudentius is very explicit. His work, however, in general, except a few definitions, and a reprefentation of the mufical characters after the manner of Alypius, is little more than an abridgment of Ariftoxenus, and that fo fhort and obfcure, that little knowledge is to be acquired by its perufal.

GAUDIANO, in *Geography*, a town of Naples, in the province of Bafilicata; 10 miles N. E. of Venofa.

GAUDIES, old Fr. jovial, riotous tunes.

GAUDIO Mell. Fiamingo, in *Biography*, a Fleming, faid by the Italians to have been the mafter of the venerable Paleftrina, by whom they mean Claude Goudimel; fee that article.

GAUDISCHKAHN, in *Geography*, a town of Pruffian Lithuania, fituated on the Angerap; five miles E. S. E. of Gumbinnen.

GAUDKE, a town of Pruffia, in the circle of Samland; eight miles N. of Pillau.

GAUDMA. See Boodh and Godama.

GAVE, a term ufed in the S. W. part of France, to exprefs a river or brook, as the gave of Oleron &c.

GAVEL, a term provincially ufed to fignify a row or fwath of corn, which has been cut down with the fcythe. It alfo fignifies ground.

Gavel, or *Gabel*, in *Law*, fignifies tribute, toll, cuftom, yearly rent, payment, or revenue, of which there were anciently feveral kinds; *gavel-corn*, *gavel-malt*, *out-gavel*, *gavel-fodder*, &c.

Gavel is fometimes alfo ufed for what we more ufually call the *gable*; which fee.

GAVELCESTER, *Sextarius Vectigalis*, a certain meafure of rent ale. Among the articles to be charged on the ftewards and bailiffs of the manors belonging to the church of Canterbury in Kent, according to which they were to be accountable, this of old was one: "de gavelcefter cujuflibet bracini braciati infra libertatem maneriorum, *viz.* Unam logenam & dimidiam cerevifiæ." This duty elfewhere occurs under the name of *tolcefter*, in lieu whereof, the abbot of Abingdon was wont of cuftom to receive the penny mentioned by Selden, in his Differtation annexed to Fleta, c. 8. Nor does it differ from what is called *oakgavel* in the gloffary at the end of the laws of Henry I.

GAVELET, Gaveletum, in *Law*, a fpecial and ancient kind of *ceffavit* ufed in Kent, where the cuftom of gavel-kind continues; whereby the tenant fhall forfeit his lands and tenements to the lord, if he withdraw from him his due rents and fervices.

The procefs of the gavelet is thus: the lord is firft to feek by the fteward of his court, from three weeks to three weeks, to find fome diftrefs upon the tenant, till the fourth court; and if, at that time, he find none, at this fourth court it is awarded, that he take the tenement in his hand, in name of a diftrefs, and keep it a year and a day without manuring; within which time, if the tenant pay his arrears, and make reafonable amends for the with-holding, he fhall have and enjoy his tenement as before; if he come not before the year and day be paft, the lord is to go to the next county court, with witneffes of what had paffed at his own court, and pronounce there his procefs to have farther witneffes; and then, by the award of his own court, he fhall enter and manure the tenement as his own; fo that, if the tenant defire afterwards to have and hold it as before, he muft agree with the lord, according to this old faying: "has he not fince any thing given, or any thing paid, then let him pay five pound for his were, ere he become healder again." Other copies have the latter part with fome variations: "let him nine times pay, and nine times repay."

The word gavelet, in its original fignification, imported rent; but it means alfo a procefs for the recovery of rent peculiar to Kent, and London. The gavelet, thus prevailing by the cuftom of Kent, may be ufed whether there be a fufficient diftrefs on the land or not; but is reftricted to gavel-kind tenure. This remedy of gavelet, as well as that of *ceffavit*, is now wholly fallen into difufe; nor, whilft they continued in ufe, were they applicable, except where the tenure was in fee. Booth on Kent Act. 133. 1 Inft. 142. n. 2.

Gavelet, in London, a writ ufed in the huftings of London, "Breve de gaveleto in London, pro reditu ibidem quia tenementa fuerunt indiftringibilia." And the ftatute of gavelet, 10 Edw. II. gives this writ to lords of rents in the city of London as well as in Kent. Here the parties, tenant and demandant, appear by *fcire facias*, to fhew caufe why the one fhould not have his tenement again, on payment of his rent, or the other recover the lands, on default thereof.

GAVEL-GELD, denoted payment of tribute or toll. Mon. Angl. tom. 3.

GAVEL-KIND, a tenure or cuftom, annexed and belonging to lands in Kent, whereby the lands of the father are equally divided, at his death, among all his fons; or the lands of the brother among all the brethren, if he have no iffue of his own. Lit. 210.

Lambard compounds this term of the three Saxon words *gyfe*, *eal*, *kyn*, *omnibus cognatione proximis data.* Verftegan calls it *gavelkind*, quafi *give all kind*, *i. e.* to each child his part; and Taylor, in his Hiftory of Gavel-kind, derives it from the Britifh *gavel*, *i. e.* a hold or tenure, and *cenned*, or *cenedl*, *generatio*, or *familia*; and thus *gavel cenedl* might fignify *tenura generationis*.

"Teutonicis prifcis patrios fuccedit in agros
Mafcula ftirps omnis, ne foret ulla potens."

This cuftom anciently obtained throughout England, before the year 1066; but after the conqueft, when knight-fervice was introduced, the defcent was reftrained to the eldeft fon for the prefervation of the tenure. (Lamb. 167. 3 Salk. 129.) But it is ftill of force in a great part of Kent, Urchenfield in Herefordfhire, and elfewhere, though with fome difference: but, by the ftat. 34 and 35 Hen.

Hen. VIII. c. 26. all gavel-kind lands in Wales are made defcendible to the heir, according to the courfe of common law; whereby it appears, that this tenure was alfo in that principality; and was probably of Britifh original.

In an ancient book of records in Chrift-church, Canterbury, of the time of Henry VIII. our Saxon anceftors are faid to have held all their lands either by writing, or without; the firft were called *bockland*, whofe owners were men, whom we now call *freeholders*: the fecond were called *folkland*, the owners whereof were of fervile condition, and poffeffed *ad voluntatem domini*. Now the inheritance, or freehold, did not, in thofe days, defcend to the eldeft fon, but to all alike; which, in Saxon, was called *landefcyftan*; and, in Kent, to *fhift land*; whence came the cuftom gavelkind. And the reafon why it was retained in Kent more than other places was, that the people of Kent, upon the Norman invafion, could not be induced to furrender to the conqueror, but on thefe conditions, that they fhould retain their ancient county-cuftoms without any infringement or diminution; and efpecially that called *gavelkind*.

Blount, in v. *Gavelkind*, relates a ftory of the Kentifh men furrounding Will. I. with a moving wood of boughs, and thus obtaining a confirmation of their ancient rights.

In the reign of Hen. VI. there were not above thirty or forty perfons in the whole county of Kent, who held by any other tenure than this of gavel-kind; which was afterwards altered upon the petition of feveral Kentifh gentlemen, with regard to great part of the land of that county, fo as to be defcendible to the eldeft fon, according to the courfe of common law; by 31 Hen. VIII. c. 3.: though the cuftom to devife gavel-kind land ftill remains; and all lands in Kent fhall be taken to be gavel-kind, except thofe which are *difgavelled* by particular ftatutes. (Co. Lit. 140.) Blackftone relies on the nature of tenure in gavel-kind, as a pregnant proof that tenure in free focage was a remnant of Saxon liberty. It is well known that the Kentifh men vigoroufly ftruggled to preferve their ancient liberties, and thefe ftruggles were attended with fuccefs. And as it is principally in Kent that we find the cuftom of gavelkind, we may fairly conclude that this was a part of thofe liberties; agreeably to Mr. Selden's opinion, that gavel-kind, before the Norman conqueft, was the general cuftom of the realm.

The diftinguifhing properties of this tenure are various; fome of the principal are thefe: the lands, held under this denomination of *gavel-kind*, which is an ancient focage tenure, defcend equally, and are divided, fhare and fhare alike, among all the male children; and, in defect of thefe, among the females. They are of age, or qualified to take the lands upon them, at fifteen; and may then give, vend, or alienate the fame to any perfon, without the confent of any lord: and children here inherit their father's land, though convicted of felony, murder, &c. according to the maxim, "The father to the bough, the fon to the plough." It has been held, however, that in matters of treafon, which ftrike at the foundations of policy and government, even gavelkind lands are forfeitable, and *always were*. The tenants in gavel-kind are to do fealty, and to be in the tuition of the next a-kin, who is not next heir after them, till fifteen years of age; to pay acknowledgment to the lord for the lands, &c.

Gavel-kind is faid to be only a fpecies of a focage tenure, modified by the cuftom of the country; the lands being holden by fuit of court and fealty, which is a fervice in its nature certain. (Wright, 211.) And therefore by a charter of king John, Hubert, archbifhop of Canterbury, was authorized to exchange the gavel-kind tenures holden of the fee of Canterbury, into tenures by knight's fervice; and by the above-mentioned ftatute of 31 Hen. VIII. c. 3. for difgavelling lands in Kent, they are directed to be defcendible, for the future, like other lands, which were never holden by fervice of focage. The immunities which the tenants in gavel-kind enjoyed, are fuppofed to be fuch as cannot be conceived to have been conferred on mere ploughmen and peafants; from all which the learned commentator apprehends it to be fufficiently clear, that tenures in free focage are in general of a nobler original than is affigned by Littleton, or after him by the bulk of common lawyers. Bl. Com. v. ii.

The cuftom of gavel-kind is not altered, though a fine be levied of the lands at common law; becaufe it is a cuftom that runs with the land. (6 E. VI.) A wife fhall be endowed of gavel-kind land, of a moiety of the land of which her hufband died feifed, during her widowhood. (Co. Litt. 3.) And it has been adjudged, that a widow cannot have election to demand her thirds or dower at common law, fo as to avoid the cuftom, by which fhe fhall lofe her dower, if fhe marry a fecond hufband. (Moor. 260. 1 Leon. 62.) See Dower. The hufband fhall be tenant by the curtefy of half the gavel-kind lands of the wife, during the time he continues unmarried, without having any iffue by his wife; but if he marry, he fhall forfeit his tenancy by the curtefy. (Co. Lit. 3.) If the hufband had iffue by his wife, he fhall be tenant by the curtefy of the whole land; and though he marry he fhall not forfeit his tenancy. (Mich. 21 Car. B.R. 1 Lil. Abr. 649.)

A rent in fee granted out of gavel-kind lands fhall defcend in gavel-kind to all the heirs male, as the lands would have done; it being of the fame nature with the land itfelf. (2 Lev. 138. 1 Mod. 97.) If lands are alleged to be in Kent, it fhall be intended that they are gavel-kind; if the contrary doth not appear. (2 Sid. 153.) By Hale, Ch. J. gavel-kind law is the law of Kent, and is never pleaded, but prefumed; and it has been held that the fuperior courts may take notice of gavel-kind generally without pleading; though not of the fpecial cuftom of devifing it, which ought to be pleaded fpecially. (1 Mod. 98. Cro. Car. 465. Lutw. 236. 756.)

The gavel-kind defcent of lands in Ireland was an incident to the cuftom of *taniftry*; and as fuch fell to the ground with its principal, in confequence of a folemn judgment againft the latter in a cafe Ann. 5 Jac. I. (Dav. Rep. 28.) But in the reign of queen Ann the policy of weakening the Roman Catholic intereft in Ireland was the caufe of an Irifh ftatute to make the lands of papifts defcendible according to the gavel-kind cuftom, unlefs the heir conformed within a limited time. (See Rob. on Gavelkind, c. 17.) However now, by an Irifh ftatute of the prefent reign (17 and 18 Geo. III. c. 49.) the defcent of the lands of papifts is again reduced to the courfe of the common law. (1 Inft. 176. n. 1.)

GAVELKOVEN, in *Geography*, a town of Germany, in Lower Bavaria; 20 miles S.E. of Landfhut.

GAVELLER, in *Mining*, fignifies a bar-mafter or bailiff of a mineral liberty or diftrict, an officer who collects the cope, tolls, or dues of the king, or lord of the foil, from the feveral mine-adventurers; to whom alfo he gives poffeffion of their mines, according to the eftablifhed laws and cuftoms of the field or diftrict. See Mining.

GAVELLING, is the act of freeing a mine, or obtaining the right to work it, by paying the accuftomed fees to the gaveller or bar-mafter, whether in ore obtained from the mine to be freed, as is the cuftom of the king's field in Derbyfhire, or in money, as is done in fome diftricts.

GAVELLO, in *Geography*, a town of Italy, in the Polefino de Rovigo; 8 miles S.W. of Adria.

GAVELMAN, a tenant who is liable to tribute.

"Villani de Terring, qui vocantur gavelmanni." Somner, *Gavelkind*. Hence gavel-kind has been thought to be land in its nature taxable. Blount.

GAVELMED, the duty or work of mowing grafs, or cutting of meadow land, required by the lord from his cuftomary tenants. "Confuetudo falcandi quæ vocatur gavelmed." Somner.

GAVELOCK, in *Rural Economy*, an iron bar or crow ufed in entering ftakes, pofts, &c. into the earth. It fhould have fufficient fubftance in order to prevent its being bent in employing it; and have a claw at one end for the purpofe of wrenching out nails, &c.

GAVELRIP, bedreap, or duty of reaping, at the command of the lord—"de confuetudine metendi 40 acras et dimid. de gavelrip in autumno 40 fol. et fex denar."

GAVELWERK, was either *manu-opera*, by the hands and perfon of the tenant, or *carr-opera*, by his carts or carriages.

GAVENNY, in *Geography*, a river of Wales, which runs into the Ufk, near Abergavenny.

GAUER, a river of Scotland, which forms a communication between loch Lydoch and loch Rannock.

GAVEREN, a town of France, in the department of the Scheldt, on the Scheldt; 7 miles E. of Ghent.

GAUERS, a town of Silefia, in the principality of Neiffe; 5 miles W.N.W. of Potfchau

GAVETA, La, a town of Naples, in Capitanata; 16 miles S.W. of Manfredonia.

GAVETTO, a fea-port town of Algiers, on the eaft fide of the gulf of Stora.

GAUGAMELA, in *Ancient Geography*, a fmall place of Afia, on a plain between the rivers Zabus and Bumadus, to the north of the place where the latter difcharges itfelf into the former. This place is famous for the battle, called the battle of *Arbela*; which fee.

GAUGE, in *Engineery*, fometimes fignifies the fame with weir: a gauged bar is an upper gate, or over-fall to a weir. See Smeaton's Reports, vol. i. p. 62.

Gauge-*line*, a line on the common gauging-rod, whofe defcription and ufe fee under the article Gauging.

Gauge-*point* of a folid meafure is the diameter of a circle, whofe area is equal to the folid content of the fame meafure.

Thus the folidity of a wine gallon being 231 cubic inches: if you conceive a circle to contain fo many inches, the diameter of it will be 17.15: and that will be the gauge-point of wine meafure.

And an ale-gallon containing 282 cubic inches; by the fame rule, the gauge-point for ale-meafure will be found to be 19.15: and after the fame manner may the gauge-point of any other meafure be determined.

Hence we deduce, that when the diameter of a cylinder in inches is equal to the gauge-point in any meafure (given likewife in inches) every inch in length thereof will contain an integer of the fame meafure. In a cylinder, whofe diameter is 17.15 inches, every inch in height contains one entire gallon in wine-meafure; and in another, whofe diameter is 19.15, every inch in length contains only one ale-gallon.

Gauge-*weir*, in *Enginecry*, is a weir or over-fall, out of fome refervoir, or pound of a canal, calculated to difcharge a given quantity of water daily, for the fupply of mills, or fome other canal. See Canal.

GAUGER, an officer appointed by the king to gauge, *i. e.* to examine or meafure, all cafks, tuns, pipes, barrels, hogfheads of beer, wine, oil, &c. and to give them a mark of allowance (which is a circle burnt with an iron) before they be fold in any place within the extent of this office.

Of this officer and his office we have many ftatutes; thus, by 27 Edw. III. c. 8. all wines, &c. imported, are to be gauged by the king's gaugers or their deputies; by 31 Edw. III. c. 5. felling wine before gauged, incurs forfeiture, or the value: and by 23 H. VI. c. 15. the gauge penny is to be paid gaugers on gauging wines. The 31 Eliz. ordains that beer, &c. imported fhall be gauged by the mafter and wardens of the Coopers' company: fee 12 Car. II. c. 4. The wardens of the Coopers fhall attend to gauge veffels upon requeft. 23 Hen. VIII. c. 4. Gaugers may take famples not exceeding half a pint, 32 Geo. II. c. 29. See Excise.

GAUGING, the art or act of meafuring the capacities or contents of all kinds of veffels, and determining the quantity of fluids or other matters contained therein.

Gauging is the art of reducing the unknown capacity of veffels of divers forms, cubical, parallelepepidal, cylindrical, fpheroidal, conical, &c. to fome known cubic meafure; and of computing, for inftance, how many gallons, quarts, pints, or the like, of any liquor, *e. gr.* ale, beer, wine, brandy, &c. are contained therein.

Gauging is a branch of ftereometry.

The principal veffels that come under its operation are pipes, barrels, rundlets, and other cafks; alfo backs, coolers, vats, &c.

The folid content of cubical, parallelepepidal, and prifmatical veffels, is eafily found in cubic inches, or the like, by multiplying the area of the bafe by the perpendicular altitude.

And for cylindrical veffels, the fame is found by multiplying the area of the circular bafe by the perpendicular altitude, as before.

Cafks of the ufual form of hogfheads, kilderkins, &c. may be confidered as fegments of a fpheroid cut off by two planes perpendicular to the axis: which brings them to Oughtred's theorem for meafuring ale and wine cafks, which is thus: add twice the area of the circle at the bung to the area of the circle of the head; multiply the fum by one-third of the length of the cafk, the product is the content of the veffel, in cubic inches. But for accuracy, Dr. Wallis, Mr. Cafwell, &c. think, that moft of our cafks had better be confidered as fruftums of parabolic fpindles, which are lefs than the fruftums of fpheroids of the fame bafe and height, and give the capacity of veffels nearer the truth than either Oughtred's method, which fuppofes them fpheroids; or than that of multiplying the circles of the bung and head into half the length of the cafk, which fuppofes them parabolic conoids: or than that of Clavius, &c. who takes them for two truncated cones: which is fartheft off of all.

The common rule for all wine or ale cafks is to take the diameters at the bung, and at the head, by which you may find the area of the circle there; then taking two-thirds of the area of the circle at the bung, and one-third of the area of the circle at the head, and adding them together into one fum, this fum, multiplied by the internal length of the cafk, gives the content in folid inches; which are converted into gallons, by dividing by 282 for ale, and by 231 for wine gallons.

The readieft method for common ufe is to reduce the cafk to

to a cylinder of equal contents; and this is done by confidering what is called the variety of the cafk. Suppofe a cylinder infcribed in a cafk, and another circumfcribed about it, there will be a cylindrical fpace included between the fuperficies of the two cylinders, whofe diameter or thicknefs is equal to the difference between the bung and head diameters of the cafk; the curvature of the ftaves of the cafk takes in a certain proportion of the cylindrical fpace, which is greater or lefs, as the curvatures bend, or bulging of the ftaves is greater or lefs; and this determines what is called the variety; and it will be the firft variety, if the cafk bulges very much; fecond variety, if lefs, and fo on: it is, therefore, evident, that the diameter of the infcribed circle may be increafed fo as to take in a portion of the interjacent cylindrical fpace equal to that taken in by the curvature of the ftaves of the cafk; and then the cafk and increafed cylinder will be equal in content. The diameter of the infcribed cylinder is the head diameter of the cafk; the thicknefs of the cylindrical fpace is equal to the difference between the bung and head diameters. The only difficulty, therefore, lies in determining what portion of this difference muft be added to the head diameter of the cafk, in order to obtain the diameter of the mean cylinder, or the cylinder of equal content. Now experience fhews, that if 7-10ths of the difference between the head and bung diameters of any cafk be added to the head diameter, the cylinder whofe diameter is equal to this fum, and whofe length is equal to that of the cafk, will contain as much or more than that cafk, though the ftaves have the greateft degree of curvature that is ever given to them. And as the difference between the bung and head-diameters of cafks is feldom very great, the contents of a cafk whofe ftaves are quite ftraight from bung to head, or of a cafk made up of two equal fruftums of two equal cones, will generally be nearly equal to the contents of a cylinder, whofe diameter is equal to the fum of the head diameter of the cafk, and a little more than half the difference between the bung and head diameters, and whofe length is equal to the length of the cafk. Therefore, all the varieties of which cafks are capable, lie between 5-10ths and 7-10ths of the difference between the bung and head diameters; and the gauger has only to take fuch a part of this difference (always between 5-10ths and 7-10ths) as his judgment and experience inform him to be moft fuitable to the curvature of the cafk; and this, added to the head diameter, gives the diameter of the mean cylinder.

It may not be amifs to note here, that the difference between the bung and head diameters may be very great, and yet the cafk have no bulging at all, for the bulging is the bend or curvature of the half-ftave, between the bung and the head.

Mathematicians give us abftrufe theorems, for computing the contents of cafks, upon the fuppofed refemblance between the curvature of the cafk and that of an ellipfis, parabola, or hyperbola; but they may be as much miftaken in judging of the curvature, as an experienced gauger between 5-10ths and 7-10ths: for after all, the contents of cafks cannot be determined to a mathematical exactnefs; becaufe the forms of cafks do not exactly anfwer any mathematical figures. The bufinefs of gauging is at beft but guefs-work; but it is fuch a way of gueffing, as comes near enough the truth for the common purpofes of life.

Hence we may add fuch decimal multipliers, for the difference between bung and head diameters as have been found by experience to be the trueft, and beft fuited to the feveral varieties or curvatures of cafks.

Firft variety, or ftaves very much bulging,	.7 or .695
Second variety, or ftaves not fo much curved,	.65 or .63
Third variety, or ftaves ftill lefs curved,	.6 or .56
Fourth variety, or ftaves almoft ftraight,	.55 or .51

The following rule will ferve for gauging cafks by the pen: take the difference of the bung and head diameters of any cafk, and multiply that difference by the number which ftands againft the name of the cafk given in the table, add the product to the head diameter; and the fum will be the diameter of a cylinder, which, being of the fame length with the given cafk, will contain as much; fquare the diameter thus found, and multiply that fquare by the length, and divide the product by 359 for beer gallons, and 294 for wine.

The multipliers for a cafk, which is taken for varieties:

The middle fruftum	1. Of a fpheroid	.7	greateft bulge.
	2. Of a parab. fpindle	.63	next lefs.
	3. Two conoids	.56	next lefs to that.
	4. Two cones	.51	next lefs to that.

Example.—Let a cafk be taken as the middle fruftum of a fpheroid, the bung diameter of which is 32 inches, the head 26, and length 50 inches; what is the content in beer and wine gallons? $\overline{32 - 26} \times .7 = 4.2$. To which add 26, and we fhall have 30,2 for the mean diameter; and $\overline{30.2}|^2 = 912.04$, which multiplied by the length 50 will give 45602; and $\frac{45602}{359} = 127$ beer gallons; and $\frac{45602}{294} = 155.1$ wine gallons. The contents of other cafks may be found in the fame manner by ufing the proper multipliers. See Everard's SLIDING *rule*.

For the ready computation of the contents of veffels, or of any folids in the meafures in ufe in Great Britain, we fhall here infert the following rules taken from a Treatife of Practical Geometry, publifhed at Edinburgh in 1745, 8vo. Vide pag. 137. feq.

1°. To find the content of a cylindric veffel in Englifh wine gallons, the diameter of the bafe and altitude of the veffel being given in inches and decimals of an inch: fquare the number of inches in the diameter of the veffel; multiply this fquare by the number of inches in the height, then multiply this product by the decimal fraction 0.0034, and you will have the contents of the veffel in gallons, and decimals of a gallon. For example, let the diameter be = D = 51.2 inches, the height = H = 62.3 inches, then will the content be D D H × 0.0034 = 51.2 × 51.2 × 62 3 × 0.0034 = 555.27342 wine gallons.

2°. Suppofing the Englifh ale gallon to contain 282 cubical inches, the content of a cylindric veffel is computed in fuch gallons, by multiplying the fquare of the diameter of the veffel by its height as before, and their product by the decimal fraction 0.0027851, that is, the folid content in gallons will be D D H × 0 0027851.

3°. If the Scotch pint contains 103.4 cubical inches, the content of fuch a veffel in Scotch pints, will be D D H × 0.0076.

4°. Suppofing the Winchefter bufhel to contain 2178 cubic inches, the content of a cylindric veffel is computed in thofe bufhels, by multiplying the fquare of the diameter of the veffel by the height, and the product by the decimal fraction 0.0003606. But the legal Winchefter bufhel containing only 2150.42 folid inches, the content of a cylindric veffel is computed in fuch bufhels, by multiplying the fquare of the diameter by the height, and their product by the decimal 0.0003652. Or the content will be D D H × 0.0003652 See BUSHEL.

5°. Suppofing the Scotch wheat firlot to contain $21\frac{1}{4}$ Scotch pints, or about 2197 cubical inches, the contents of a cylindric veffel in fuch firlots will be D D H × 0.000358.

 And

And if the beer firlot contain 31 Scotch pints, the contents of ſuch a veſſel in beer firlots will be D D H × 0.000245. See Firlot.

6°. It is to be obſerved, that when the ſection of the veſſel is not a circle, but an ellipſis, the product of the greateſt diameter by the leaſt is to be ſubſtituted in theſe rules, for the ſquare of the diameter.

7°. To compute the content of a veſſel, which may be conſidered as the fruſtum of a cone in any of thoſe meaſures. Let A repreſent the number of inches in the diameter of the greater baſe, B the number of inches in the diameter of the leſſer baſe. Compute the ſquare of A, the product of A by B, and the ſquare of B. Take the third part of the ſum of all theſe, and ſubſtitute it in the preceding rules for the ſquare of the diameter, and proceed in all reſpects as before. Thus for example, the content in wine gallons will be $\overline{AA + AB + BB} \times \frac{1}{3} H \times 0.0034$. Or thus: To the ſquare of half the ſum of A and B add one-third of the ſquare of half their difference; and ſubſtitute this ſum in the preceding rules for the ſquare of the diameter of the baſe of the veſſel. For the ſquare of $\frac{1}{2} A + \frac{1}{2} B$ added to $\frac{1}{3}$ of the ſquare of $\frac{1}{2} A - \frac{1}{2} B$ gives $\frac{1}{4} AA + \frac{1}{2} AB + \frac{1}{4} BB + \frac{1}{12} AA - \frac{1}{6} AB + \frac{1}{12} BB = \frac{1}{3} AA + \frac{1}{3} AB + \frac{1}{3} BB$.

8°. When the veſſel is a fruſtum of a parabolic conoid, meaſure the diameter of the ſection at the middle of the height of the fruſtum: and the content will be the ſame as of a cylinder of this diameter, of the ſame height with the veſſel.

9°. When a veſſel is a fruſtum of a ſphere, if you meaſure the diameter of the ſection at the middle of the height of the fruſtum, then compute the content of a cylinder of this diameter, and of the ſame height with the veſſel, and from this ſubtract $\frac{1}{3}$d of the content of a cylinder of the ſame height, on a baſe, the diameter of which is equal to that height; the remainder will give the content of the veſſel. That is, if D repreſent the diameter of the middle ſection, and H the height of the fruſtum, you are to ſubſtitute $DD - \frac{1}{3} HH$ for the ſquare of the diameter of the cylindric veſſel in the firſt ſix rules.

10°. When the veſſel is a fruſtum of a ſpheroid, if the baſes are equal, the content is readily found by the rule given from Oughtred. In other caſes, let the axis of the ſolid be to the conjugate axis, as n to 1; let D be the diameter of the middle ſection of the fruſtum, H the height or length of the fruſtum, and ſubſtitute in the firſt ſix rules $DD - \frac{HH}{3nn}$ for the ſquare of the diameter of the veſſel.

11°. When the veſſel is a hyperbolic conoid, let the axis of the ſolid be to the conjugate axis as n to 1, D the diameter of the ſection at the middle of the fruſtum H, the height or length, compute $DD + \frac{HH}{3nn}$, and ſubſtitute this ſum for the ſquare of the diameter of the cylindric veſſel in the firſt ſix rules.

12°. In general, it is uſual to meaſure any round veſſel, diſtinguiſhing it into ſeveral fruſtums, and taking the diameter of the ſection at the middle of each fruſtum; thence to compute the content of each, as if it was a cylinder of the mean diameter; and to give their ſum as the content of the veſſel. From the total content computed in this manner they ſubtract ſucceſſively the numbers which expreſs the circular areas that correſpond to thoſe mean diameters, each as often as there are inches in the altitude of the fruſtum to which it belongs, beginning with the uppermoſt; and in this manner calculate a table for the veſſel, by which it readily appears how much liquor is at any time contained in it, by taking either the dry, or the wet inches; having regard to the inclination, or drip of the veſſel, if it has any.

This method of computing the content of a fruſtum from the diameter of the ſection at the middle of its height, is exact in that caſe only when it is a portion of a parabolic conoid; but in ſuch veſſels as are in common uſe the error is not conſiderable. When the veſſel is a portion of a cone or hyperbolic conoid, the content by this method is found leſs than the truth; but when it is a portion of a ſphere or a ſpheroid, the content computed in this manner exceeds the truth. The difference or error is always the ſame in different parts of the ſame, or ſimilar veſſels, when the altitude of the fruſtum is given. And when the altitudes are different, the error is in the triplicate ratio of the altitude. If exactneſs be required, the error in meaſuring the fruſtum of a conical veſſel, in this manner, is $\frac{1}{4}$th of the content of a cone, ſimilar to the veſſel, of an altitude equal to the height of the fruſtum. In a ſphere it is $\frac{1}{3}$d of a cylinder, of a diameter and height equal to the fruſtum. In the ſpheroid and hyperbolic conoid, it is the ſame as in a cone, generated by the right-angled triangle contained by the two ſemiaxes of the figure revolving about that ſide which is the ſemiaxis of the fruſtum. Theſe are demonſtrated in a treatiſe of fluxions by Mr. Maclaurin, where thoſe theorems are extended to fruſtums that are bounded by planes oblique to the axis in all the ſolids, that are generated by any conic ſection revolving about either axis. Vide p. 25. and 715.

In the uſual method of computing a table for a veſſel, by ſubducting from the whole content the number that expreſſes the uppermoſt area, as often as there are inches in the uppermoſt fruſtum, and afterwards the numbers for the other areas ſucceſſively, it is obvious that the contents aſſigned by the table, when a few of the uppermoſt inches are dry, are ſtated a little too high, if the veſſel ſtands on its leſſer baſe, but too low when it ſtands on its greater baſe; becauſe, when one inch is dry, for example, it is not the area at the middle of the uppermoſt fruſtum, but rather the area at the middle of the uppermoſt inch, that ought to be ſubducted from the total content, in order to find the content in this caſe.

But gauging, as now practiſed, is chiefly done by means of inſtruments called *gauging-rods*, or *rules*, which do the buſineſs at once, and anſwer the queſtion without ſo much calculation; which is no inconſiderable addition, both to the eaſe and diſpatch of the work. This inſtrumental way of gauging, therefore, we ſhall here chiefly inſiſt upon.

Dr. Hutton in his "Menſuration" has given rules for computing the contents of the various fruſtums of ſolids, which bear reſemblance to the ſeveral varieties or forms of different caſks. Rules adapted to theſe forms will be found under the denominations of the ſeveral ſolids to which they belong in this Cyclopædia; and they occur in moſt books, profeſſedly written on the ſubject of Gauging. We ſhall here ſubjoin one general rule, extracted from the above-cited treatiſe, (p. 592) which may be eaſily applied to the caſes that occur.

General Rule.

Add into one ſum 39 times the ſquare of the bung diameter,
25 times the ſquare of the head diameter,
and
26 times the product of thoſe diameters.

Multiply the ſum by the length of the caſk, and the product by the number .00034; then this laſt product divided by 9 will

will give the wine gallons, and divided by 11 will give the ale gallons: or, $\overline{39\,B^2+25\,H^2+26\,BH} \times \frac{L}{114}$ is the content in inches; which being divided by 231 for wine gallons, or by 282 for ale gallons, will be the content.

E. G. If the length of a caſk be 40 inches, the bung diameter 32, and the head diameter 24.

$$\begin{array}{rr} \text{Here } 32^2 \times 39 = & 39936 \\ 24^2 \times 25 = & 14400 \\ 32 \times 24 \times 26 = & 19968 \\ \hline \text{The ſum - -} & 74304 \\ \text{multiplied by -} & 40 \\ \hline \text{divided by } 114) & 2972160 \\ \text{gives - -} & 26071 \end{array}$$

cubic inches: and this divided by 231 gives 112 wine gallons, or divided by 282 gives 92 ale gallons.

Conſtruction of a Gauging-rod, whereby the content of any cylindrical, or common veſſel, is eaſily had.—Take the diameter A B of a cylindrical veſſel, A B D E, *Plate* IV. *Surveying, fig.* 2, that holds one of the meaſures wherein the fluid is eſtimated, *e. gr.* gallons, and join it at right angles to the indefinite line A 7. From A to 1, ſet off a right line equal to A B; then will B 1 be the diameter of a veſſel, that holds two meaſures, or gallons, of the ſame height as the former.

Again, let A 2 = B 1; then will B 2 be the diameter of a veſſel that holds three meaſures, but of the ſame height as that which only holds one. And, after the ſame manner, find the diameter of other large veſſels, B 3, B 4, B 5, B 6, B 7, &c.

Laſtly, ſet off the ſeveral diviſions thus found, A 1, A 2, A 3, &c. upon the ſide of a rod or rule; and, on the other, the height or depth of a cylinder, that holds one meaſure or gallon, repeated as oft as it will go. Thus is the gauging-rod complete.

For cylinders, that have the ſame altitude, are to each other as the ſquares of their diameters; conſequently the ſquare of the diameter of the veſſel that holds 2, 3, or 4 gallons, muſt be double, triple, or quadruple of that which only holds one. And ſince in the firſt, A B = A 1, the ſquare of B 1 is double, that of B 2 triple, that of B 3 is quadruple, &c. it is evident, that the right lines A 2, A 3, A 4, &c. are the diameters of the veſſels required.

Theſe diviſions, therefore, being applied to the ſide of a cylindrical veſſel, it will immediately appear how many meaſures, *e. gr.* gallons, a cylindrical veſſel of that baſe, and of the height of that which holds one gallon, will contain.

Wherefore, finding by the diviſions on the other ſide of the rod, how often the height of one gallon is contained in the height of the given veſſel; and multiplying the diameter before found by this number; the product will be the number of gallons the veſſel contains.

Thus, *e. gr.* if the diameter of the cylindrical veſſel be 8, and its height 12, its contents will be 96 gallons.

Note, 1. The leſs you take the height of the cylinder containing one gallon, the greater will the diameter of the baſe be: whence both that, and the diameters of the cylinders containing ſeveral gallons, will be the more eaſily diviſible into leſſer parts. Bayer directs ſuch height to be only one digit, or tenth of an inch.

2. The diameters of veſſels holding one or more decimal parts of a gallon will be had, by dividing one or more decimal parts of the veſſel holding a whole gallon, by its height: which gives us the area of the circular baſe; from whence the diameter is eaſily found by the rules delivered under DIAMETER, CIRCLE, &c. And after the ſame manner, the diameters are found for the diviſions of veſſels, that hold two or more gallons.

GAUGING-*rod, uſe of the.*—To find the content of a caſk; that is, to determine the number of meaſures, *e. gr.* gallons, it will hold: apply the gauging-rod to the veſſel, as directed in the preceding article, and find both the length of the caſk, A C, *fig.* 3, and both diameters, G H and A B. Now, as we find, by experiment, how far ſoever it may be from geometrical exactneſs, that a common caſk of this form may ſafely enough be reputed as a cylinder, whoſe baſe is a medium between the head and the belly; find ſuch medium, which call the *equated diameter.*

Then multiplying the number thus found by the length of the caſk A C, the product will be the number of meaſures the veſſel contains.

Suppoſe, *e. gr.* A B = 8, and G H = 12, and A C = 15, the equated diameter will be 10, which multiplied by 15, gives the capacity of a caſk, 150 meaſures.

If it happen, that the diameters of the two ends be not equal, meaſure them both, and take half their ſum for the diameter to work by.

There is another method whereby the content of a veſſel is had, without any calculation at all, which obtains in divers parts of Germany and the Low-Countries: but as this ſuppoſes all veſſels to be ſimilar to each other, and their length double of the equated diameter, that is, of half the ſum of the diameters A B and G H, it is not ſafe to uſe it in all places. Kepler, however, prefers it ſo much before all others, as including all the precautions poſſible, that he recommends it to the public, to enact it by law, that all caſks be made in this proportion.

The methods of gauging, which chiefly obtain among us, are, by the four-foot gauging-rod, and Everard's ſliding-rule.

GAUGING-*rod, deſcription and uſe of the four-foot.*—The four-foot gauging-rod, repreſented in *fig.* 4, is uſually made of box, and conſiſts of four rules each a foot long, and about three-eighths of an inch ſquare, joined together by three braſs joints; by which means the rod is rendered four feet long, when the four rules are quite opened, and but one foot when they are all folded together.

On the firſt face of this rod, marked 4, are placed two diagonal lines; one for beer, and the other for wine: by means of which the content of any common veſſel in beer or wine gallons may be readily found, by putting the rod in at the bung-hole of the veſſel, till it meets the interſection of the head of the veſſel with the ſtaves oppoſite to the bung-hole. For diſtinction of this line, there is written on it, *beer* and *wine gallons.*

On the ſecond face, 5, are a line of inches, and the gauge-line; which is a line expreſſing the areas of circles, whoſe diameters are the correſpondent inches in ale gallons. At the beginning is written, *ale area.*

On the third face, 6, are three ſcales of lines; the firſt, at the end of which is written *hogſhead,* is for finding how many gallons there are in a hogſhead, when it is not full, lying with its axis parallel to the horizon. The ſecond line, at the end of which is written *B. L.* ſignifying a *butt lying,* is for the ſame uſe as that for the hogſhead. The third line is to find how much liquor is wanting to fill up a butt when it is ſtanding: at the end of it is written *B. S.* ſignifying a *butt ſtanding.* In the half of the fourth face of the gauging-rod, 7, there are three ſcales of lines, to find the wants in a firkin, kilderkin, and barrel, lying with their

their areas parallel to the horizon. They are diftinguifhed by letters *F. K. B.* fignifying a *firkin, kilderkin,* and *barrel.*

Gauging-*rod, ufe of the diagonal lines on the.*—To find the content of a veffel in beer or wine gallons, put the brafed end of the gauging-rod into the bung-hole of the cafk, with the diagonal lines upwards, and thruft its brafed end to the meeting of the head and ftaves; then with chalk, make a mark at the middle of the bung-hole of the veffel, and alfo on the diagonal lines of the rod, right againft, over one another, when the brafed end is thruft home to the head and ftaves: then turn the gauging-rod to the other end of the veffel, and thruft the brafed end home to the end, as before.

Laftly, fee if the mark made on the gauging-rod come even with the mark made on the bung-hole, when the rod was thruft to the other end; which if it be, the mark made on the diagonal lines will, on the fame lines, fhew the whole content of the cafk in beer or wine gallons.

If the mark made on the bung-hole be not right againft that made on the rod, when you put it the other way, then, right againft the mark made on the bung-hole, make another on the diagonal lines; and the divifion on the diagonal line, between the two chalks, will fhew the veffel's whole content in beer or wine gallons.

Thus, *e. gr.* if the diagonal line of a veffel be 28 inches four-tenths, its contents in beer gallons will be near 51, and in wine gallons 62.

If a veffel be open, as a half-barrel, tun, or copper, and the meafure from the middle on one fide to the head and ftaves be 38 inches, the diagonal line gives 122 beer gallons; half of which, *viz.* 61, is the content of the open half tub.

If you have a large veffel, as a tun or copper, and the diagonal line, taken by a long rule, proves 70 inches; the content of that veffel may be found thus:

Every inch at the beginning-end of the diagonal line, call ten inches. Thus ten inches become 100 inches; and every tenth of a gallon call 100 gallons; and every whole gallon call 1000 gallons.

Exam.—At 44.8 inches, on the diagonal beer-line, is 200 gallons; fo that four inches 48 parts, now called 44 inches 8 tenths, is juft two-tenths of a gallon, now called 200 gallons: fo alfo, if the diagonal line be 76 inches and 7 tenths, a clofe cafk, of fuch diagonal, will hold a 1000 beer gallons; but an open cafk but half fo much, *viz.* 500 beer gallons.

Gauge-*line, ufe of the.*—To find the content of any cylindrical veffel in ale gallons: feek the diameter of the veffel in inches, and, juft againft it, on the gauge-line, is the quantity of ale gallons contained in one inch deep: this, multiplied by the length of the cylinder, will give its content in ale gallons.

For example, fuppofe the length of the veffel 32.06, and the diameter of its bafe 25 inches; to find what is the content in ale gallons?

Right againft 25 inches, on the gauge-line, is one gallon, and 745 of a gallon; which multiplied by 32.06, the length, gives 55.9447 gallons for the content of the veffel.

The bung diameter of a hogfhead being 25 inches, the head diameter 22 inches, and the length 32.06 inches, to find the quantity of ale gallons contained in it?

Seek 25, the bung diameter, on the line of inches; and right againft it, on the gauge-line, you will find 1.745: take one-third of it, which is .580, and fet it down twice: feek 22 inches in the head diameter, and againft it you will find, on the gauge-line, 1.356; one-third of which, added to twice .580, gives 1.6096; which multiplied by the length 32.06, the product will be 51.603776, the content in ale gallons.

Note, this operation fuppofes, that the aforefaid hogfhead is in the figure of the middle fruftum of a fpheroid.

The ufe of the lines on the two other faces of the rod is very eafy; you need only put it downright into the bung-hole (if the veffel you defire to know the quantity of ale gallons contained therein be lying) to the oppofite ftaves; and then where the furface of the liquor cuts any one of the lines appropriated to that veffel, will be the number of gallons contained in that veffel.

The defcription and ufe of Everard's fliding-rule for gauging, fee under Sliding-*rule.*

GAUGING Master, on *Canals,* is an officer appointed to meafure, weigh, and afcertain exactly the tonnage of the boats ufed on canals; the procefs of which, as practifed on the Grand Junction canal, we have defcribed under the article Canal. It may be proper here, however, to remark, that the practice, now followed on many of the Britifh canals, was firft fuggefted by Thomas Walker, efq. of Bilborough, Notts, in 1798, who contrived a weighing-houfe, and with the concurrence of the Cromford canal company, and thofe of the Derby, Erewafh, Grantham, Leicefter, Milton-Mowbray, Nottingham, Nutbrook, and Trent canals and navigations, drew up a fet of general regulations for the boats ufed on all thefe navigations, and fuperintended the gauging of the firft fet of boats, and the eftablifhment of gauging-mafters, at the fouth end of the Erewafh canal, and other places, for gauging the boats, affixing proper numbers and graduated plates on each, for afcertaining thereby the exact loading carried by each boat, every time which it paffed a weighing-houfe; and in order to abolifh a practice which had previoufly prevailed, of giving large and unequal weights to the purchafers of coals, at the different wharfs belonging to the coal-mafters, on the Cromford, Erewafh, Nottingham, and Nutbrook canals. The coal-mafters of that diftrict, with fome very few exceptions, came to the refolution of all felling their coals by the gauging-mafter's accounts, and by which alfo the canal-companies agreed to take their tonnage: and thus one uniform weight is eftablifhed in the trade on thefe feveral canals. The full particulars of the dimenfions and condition of the feveral boats ufing thefe navigations, fhewing the loading which they have on board at every inch of their draught of water, is printed from time to time, in an uniform manner, fo as to bind up in octavo volumes for the ufe of the feveral gauging-mafters, boat-owners, colliers and traders, &c. Of thefe we have feen four volumes, printed by Tupman & Co. of Nottingham, containing the particulars of 430 wide and 60 narrow boats. Mr. Walker was, in January 1805, prefented with a large and fuperb filver cup, at the joint expence of the above canal companies, for his important fervices in contriving and bringing thefe regulations to perfection. We have been the more particular in mentioning thefe regulations, in order to call the attention of the owners and traders on other canals to the adoption of fimilar plans, by which trade in general would be much facilitated, and the fair trader protected from the deceptive arts of thofe who are ftriving to obtain bufinefs, by pretending to give large and unufual weights of their commodities to purchafers, inftead of lowering the prices, which they would do if their pretenfions to cheapnefs were well founded.

GAVI, in *Geography,* a town of Genoa, once fo ftrong as to command the pafs of the Bochetta, but now difmantled; 20 miles N. of Genoa. N. lat. 44° 43'. E. long. 8° 48'.

GAVIA,

GAVIA, a town of Spain, in the province of Grenada; four miles S.S.W. of Grenada.

Gavia, in *Ornithology*. See Larus and Sterna.

GAVIAON, the name by which the Portuguefe called the *caracara*, a fpecies of Brafilian hawk, of the bignefs of our kite.

GAVILAN, in *Natural Hiftory*, a name given by the Spaniards to a fpecies of hawk, common in the Philippine iflands; it is fomewhat larger than our fparrow-hawk, and is of a yellowifh colour on the back and wing, and whitifh under the belly: it is the moft common of all the birds of prey in that part of the world, and is very voracious and mifchievous.

GAVINO, in *Geography*, a town of Portugal, in Alentejo; 20 miles N.W. of O-Crato.

Gavino, *St.* a town of the ifland of Sardinia; 24 miles S.E. of Oriftagni.

GAVIOTA, in *Ornithology*, the name given by the Portuguefe to a water-fowl of the gull kind, common in Brafil, and called by the natives *guacu guacu*. See Larus *Hibernus*.

GAUL, or Gallia, in *Ancient Geography*, a country of Europe, bounded on the north and weft by the fea, on the eaft by the Rhine and Alps, and on the fouth by the Mediterranean and the Pyrenées, and extending from 42° 30′ to 52° N. lat., and from 4° 40′ to 8 20′ E. long. The greateft breadth was 600 Englifh miles, but much diminifhed towards each extremity; and its length was from 480 to 620 miles. It was therefore much more extenfive than modern France, before the late revolution; for to the dominions of that powerful monarchy, with its more recent acquifitions of Alface and Lorraine, we muft add the duchy of Savoy, the cantons of Switzerland, the four electorates of the Rhine, and the territories of Liege, Luxemburg, Hainault, Flanders, and Brabant. This extenfive region was called by the Greeks "Galatia," and "Celto-galatia," to diftinguifh it from Galatia, a province of Afia; and by the Romans "Gallia Ulterior, or Tranfalpina," *i. e.* Gaul beyond the Alps, in order to diftinguifh it from "Gallia Citerior, or Cifalpina," which lay on the fame fide of the Alps with Rome, and properly formed a part of Italy.

Cifalpine Gaul, which comprehended Piedmont and Lombardy, was denominated "Togata," from the Roman gown or drefs, which was ufed by the inhabitants; but this country was called "Italia Subalpina," or Italy at the foot of the Alps, by Plutarch and Pliny, and fimply Italy by Polybius. The appellation of Gallia Cifalpina, however, was antiquated in the reign of Auguftus, when he divided Italy into eleven regions; and accordingly this name frequently occurs in authors who flourifhed before, and fcarcely ever in thofe who wrote after, the reign of Auguftus. As to the boundaries of this country, it extended from the Alps and the river Varus, parting it from Tranfalpine Gaul, to the river Aefis, according to Livy, or by Pliny's account, to the city of Ancona, in the ancient Picenum. On the north, Cifalpine Gaul was divided from Rhætia by the Alps, called "Alpes Rhæticæ," and from Illyricum by the river Formio; but on this fide, the borders of Italy were, in Pliny's time, extended to the river Arfia in Iftria. On the fouth it reached to the Liguftic fea, and the Apennines parting it from Etruria; fo that, under the common name of Cifalpine Gaul, were comprehended the countries lying at the foot of the Alps, called by Pliny and Strabo the Subalpine countries, Gallia Cifpadana, and Gallia Tranfpadana. "Gallia Cifpadana" lay next to Liguria, extending from Trebia to the city of Ancona, bounded on the north by the Po and part of the Adriatic, and on the fouth by the Apennines parting it from Etruria. It was called "Gallia" from its inhabitants, and "Cifpadana," becaufe it lay on the fide of the Padus or Po, next to Rome. It was poffeffed by the Boii, the Lingones, and the Senones. "Gallia Tranfpadana" extended from the countries of the Lepontii, Libicii, and Cunini, which were referred by Strabo and Pliny to the clafs of Subalpine nations, to the Adriatic fea, and the river Formio, now Il Rifano, parting it from Iftria, being bounded on the fouth by the Po, and on the north by the Alpes Rhæticæ and Carnicæ; the former feparating it from Rhætia, now the Trentin, and the latter from the country of the Carni, now Carniola. This part of Cifalpine Gaul was inhabited by the Orobii, the Infubres, the Lævi, the Cenomani, the Euganei, and the Veneti, and contained many confiderable cities. See Italy.

Tranfalpine Gaul was called "Comata" from the long hair worn by its inhabitants; and the fouth part of it, poffeffed by the Romans and called by them "Provincia, or Romana Provincia," whence is derived the appellation of Provence, was afterwards denominated "Narbonenfis" and "Braccata," from the bracca or breeches ufed by the inhabitants. Gaul was chiefly peopled, at different periods, by colonies from Italy, to which it was contiguous; and about 120 years before the Chriftian era, when the Romans meditated the conqueft of this extenfive region, it was portioned out among three great nations. The *Celtæ*, called by Cæfar Galli or Gauls, occupied more than one half, *viz.* from the Seine and the Marne to the Garonne, and from the upper part of the Rhine to the Mediterranean. This province was anciently called "Celtica." The *Belgæ* inhabited the territory on the lower part of the Rhine. The *Aquitani* were cantoned between the Garonne, the Pyrenées, and the bay of Bifcay. When Cæfar reduced Gaul into the form of a Roman province, he divided the whole country into three parts, and named them according to three principal nations, which he found inhabiting them refpectively, *viz.* Belgia, Aquitania, and Gallia Propria. By a new divifion, B. C. 27, Auguftus extended the northern boundary of Aquitania to the Loire. The country between the Loire and the Seine was denominated "Gallia Celtica," and afterwards "Lugdunenfis," from a colony fettled at Lugdunum, or Lyons. Part of Celtica, contiguous to the Rhine, and occupied by the Sequani and Helvetii, was added to Belgica, the adjacent province. Gallia Narbonenfis firft fubmitted to the Roman arms. A fmall canton, called "Viennenfis," in the Alps, maintained its liberty until fome time after the reduction of Gaul. The remainder of Narbonenfis was divided into "Prima" and "Secunda." When the Romans gained poffeffion of thofe parts of the Belgic territory, which had been feized by the Germans not long before the age of Cæfar, they divided the country along the Rhine, from Bafil to Leyden, into "Germania Superior and Inferior." Hence, under the Antonines, Gaul is found partitioned into fix provinces, *viz.* Narbonenfis, Aquitania, Celtica or Lugdunenfis, Belgica, Germania Superior and Germania Inferior. Under the empire of Probus, about the year 278, Gaul was divided into feven provinces, *viz.* the fix former, and the Viennenfis, which had formed a part of Narbonenfis. About the year 392, Dioclefian, having divided the empire between the two Augufti and the two Cæfars, feparated the Helvetii and Sequani from Belgica, and formed a new province under the appellation of "Maxima Sequanorum." Belgica was divided into "Prima and Secunda," which was alfo the cafe with refpect to Lugdunenfis. The four provinces of the Alps, *viz.* Alpes Penninæ, Graiæ, Maritimæ, and Cottiani, were

were reduced into two, *viz.* Alpes Maritimæ and Graiæ, and placed in the department of the Gauls. The city of Bourges was withdrawn from Aquitania, and that of Langres from Belgica, and were re-united to Lugdunenſis Prima. Accordingly Gaul, under this emperor, was divided into twelve provinces, *viz.* Narbonenſis, Viennenſis, Aquitania, Lugdunenſis Prima and Secunda, Belgica Prima and Secunda, Germania Prima and Secunda, Maxima Sequanorum, Alpes Maritimæ, and Graiæ. Under the empire of Valentinian, Gaul was again divided, by the diſmemberment of Aquitania, of which were compoſed Aquitania Prima and Secunda, and Novempopulanā. The other provinces remained the ſame as they were under Diocleſian. The new provinces were Aquitania Prima and Secunda, and Novempopulana. Bourges was withdrawn from Lugdunenſis Prima, and made the metropolis of Aquitania Prima. Under the empire of Gratian the two Lugdunenſes were ſeparated into four, and Narbonenſis into two; and the number of provinces was 17, *viz.* Narbonenſis Prima and Secunda, Viennenſis, Alpes Maritimæ, Alpes Graiæ et Penninæ, Aquitania Prima and Secunda, Novempopulana, Lugdunenſis Prima, Secunda, Tertia, and Quarta, Belgica Prima and Secunda, Germania Prima and Secunda, and Maxima Sequanorum.

Such was the ſtate of Gaul, when Honorius A.D. 419, permitted the Goths to take poſſeſſion of Aquitania Secunda, a maritime province, between the rivers Garonne and Loire, the limits of which were gradually extended by the gift of ſome neighbouring territories. About the ſame period the Burgundi, a fierce and warlike tribe of Vandals, eſtabliſhed themſelves in Upper Germany, and afterwards occupied two provinces, which ſtill retain the name of that colony. The rapacity, or ambition, of the Franks was ſtimulated by the ſucceſs of thoſe invaders. Colonies multiplied along the banks of the Meuſe, the Scheld, and the Rhine, and ſoon filled the whole extent of Lower Germany.

Gaul, according to Ptolemy, was divided into four provinces, *viz.* Aquitania, Lugdunenſis, Belgica, and Narbonenſis.

Gallia Narbonenſis, comprehending Dauphiné, Provence, and Languedoc, with a part of Savoy, was at firſt divided into Prima and Secunda, and afterwards into three provinces, *viz.* Narbonenſis Propria, Viennenſis, and Narbonenſis Secunda; to which were added, Alpes Maritimæ, and Alpes Graiæ. Narbonenſis Propria, ſince called Languedoc, was chiefly inhabited by two conſiderable tribes, *viz.* the "Volcæ Arecomici," cantoned in the vicinity of the Rhone, and "Volcæ Tectoſagæ," in the weſtern parts of the province.

The *Viennenſis*, which was a province extending from Maſſilia, or Marſeilles, along the left bank of the Rhone to the lake of Geneva, was inhabited by ſeveral ſmall tribes, among which were the Allobroges, who occupied the northern diſtrict of Dauphiné, with a ſmall part of Savoy; on the S. bounded by the Iſere, on the W. by the Rhone, and on the N. by an imaginary line drawn from Lyons to Geneva:—the Vocontii, a powerful tribe who inhabited the modern dioceſes of Vaiſon and Die, together with ſome neighbouring diſtricts:—the Segalauni, poſſeſſing an inconſiderable territory near the Rhone, below the influx of the Iſere, ſince called the duchy of Valentinois:—the Tricaſtini, whoſe capital, Senomagus, now St. Paul des Trois Chateaux, lay on the left hand of the Rhone, 15 miles northward of Orange:—and the Cavares, who peopled the ſouth part of Comtat Venaiſſin, together with the principality of Orange in Provence.

Narbonenſis Secunda was occupied by the territories of the Salues, or Saluvii and Salices, a tribe of the Ligures, which reached from the ſprings of the Durance to the gulf of Lyons, and from the ſettlements of the Cavares to the Alps.

Alpes Maritimæ conſiſted of a mountainous territory on the eaſtern border of Provence, terminating at the mouth of the Varus, or Var, a ſmall river conſidered as the boundary of Gaul and Italy.

Gallia Lugdunenſis, ſo called from Lugdunum its capital, and ſometimes Celtica, from Celtæ, the general appellation of its inhabitants, extended from the Rhone weſtward to the ocean; on the S. bounded by Aquitania, and on the N. by Belgica. It was divided into Prima, Secunda, Tertia and Quarta.

Lugdunenſis Prima comprehended almoſt the whole of the modern provinces of Lyonnois, Nivernois, and Bourgogne; and was peopled by the Seguſiani, planted between the Rhone and the Loire:—the Ædui, one of the moſt powerful and opulent nations in Gaul, and ſtyled the friends of the Romans, who occupied the ſouthern parts of Bourgogne and Nivernois, *viz.* the dioceſes of Autun, Challon, Maçon, and Nevers;—and the Lingones, a conſiderable tribe, denominated by Pliny Roman allies, who eſtabliſhed themſelves on the right of the Saone, near the ſource of the Marne, in the dioceſe of Langres, formerly including that of Dijon.

Lugdunenſis Secunda was nearly of the ſame extent with Normandy, and was peopled by the Veliocaſſes, on the right hand of the Seine, in the dioceſe of Rouen:—the Caleti, on the S. coaſt called Littus Saxonicum, N. of the mouth of the Seine, in the diſtrict of Caux:—the Lexovii on the ſea-coaſt, on the left of the Seine, between the Carnutes and Viducaſſes:—the Aulerci Eburovices, above the Lexovii, on the left hand of the Seine:—the Saii, to the weſtward of the Aulerci, near the S. border of Normandy, in the dioceſs of Seez:—the Viducaſſes, a colony of the Ædui, below the Saii, on the Orne, in the dioceſe of Baieux:—the Bajocaſſes, on the ſea-coaſt, in a diſtrict watered by the Aure:—the Unelli, or Venelli, planted along the weſt coaſt of Normandy:—and the Abrincatui, who poſſeſſed a ſmall diſtrict, now called Avranchin, near the ſouth-weſt extremity of Normandy.

Lugdunenſis Tertia comprehended the provinces ſince called Bretagne, Maine, and Anjou, with a part of Touraine; inhabited by different tribes, of which the moſt conſiderable were the Turones, whoſe capital is now Tours on the Liger, or Loire, or was near that city:—the Andes, or Andecavi, in Anjou:—the Aulerci Cenomani, in the dioceſe of Mans:—the Diablintes or Diaulitæ, in Maine:—the Arvii, in the S.W. diſtrict of Maine, on the border of a river which falls into the Sarte:—the Redones in the dioceſes of Rennes, St. Malo, and Dol in Bretagne:—the Namnetes, in the dioceſe of Nantes, between the Andecavi and the ſea-coaſt, on the north ſide of the Loire:—the Veneti, in a territory called by Cæſar Venetia, now Vannes, ſeparated from the Namnetes by the river Herius, or Vilaine:—the Curioſolites, or Carioſuelites, on the E. bounded by the Redones, S. by the Veneti, W. by the Oſiſmii, N. by the ſea, in the dioceſes of St. Brieuc and St. Malo:—the Oſiſmii, on the N.W. coaſt of Bretagne, in the dioceſes of Quimper and Leon:—and the Coriſopiti, of whom no mention occurs before the 5th century, in the S.W. corner of Bretagne.

Lugdunenſis Quarta, or Senonia, included part of Orleanois, of Iſle de France, and of Champagne. It was peopled by the following tribes, *viz.* the Senones, a brave nation in an extenſive territory, on the left hand of the river Sequana or Seine, in the dioceſes of Sens and Auxerre:—the Carnutes, an ancient and powerful tribe, in Orleanois, between the Seine and the Loire:—the Pariſii, N. of the Carnutes

nutes and Senones, in the middle of Isle de France :—the Aureliani, S. of the Carnutes and W. of the Senones, in a district of Orleanois, traversed by the Loire :—the Meldi, in the diocese of Meaux :—and the Tricasses, Tricassini, or Treci, in South Champagne.

Aquitania Prima comprehended several inland modern provinces, *viz.* Berri, Marche, Auvergne, Limosin, Quercy, Rouergue, and a portion of Languedoc ; and was inhabited by the Bituriges, in Berri, to the westward of the Loire : —the Arverni, a powerful tribe in Auvergne, extending in the time of Strabo from Marseilles to the Pyrenees, and from the ocean to the Rhine ; but their territory is now represented by the dioceses of Clermont and St. Flour :—the Lemovici, in Limosin :—the Cadurci, in Quercy, on the river Oltis or Olt, called in the middle age Cadurcinum :—the Ruteni, in Rouergue :—and the Gabali and Vellavi, or Velauni, S. of the Arverni, in the western part of Languedoc.

Aquitania Secunda extended southward along the coast from the Loire to the Garonne ; and was peopled by the Bituriges Vibisci, near the mouth of the Garonne in Bourdelois :—the Meduli, in Medoc, a small district between the lower part of the Garonne and the ocean :—the Petrocorii, in Perigord, to the right of the lower part of the Garonne :—the Nitiobriges, or Nithobroges, in a territory watered by the Olt or Lot, and more extensive than the diocese of Agen, in Guienne :—the Santones, N. of the Garonne, along the sea-coast in the dioceses of Saintes and Angouleme, and territory of Aunis :—the Pictavi, or Pictones, planted between the Santones, and the river Loire, in Poitou :—and the Agesinates, an inconsiderable tribe, whose name may be recognized in Aisenai, an archdeaconry in the diocese of Lucon. See AQUITANIA.

Novempopulana, the south-west corner of France, between the river Garonne and the Pyrenean mountains, was inhabited by the Elusates, who occupied the N.W. district of Armagnac :—the Ausci, in Armagnac Cliberris, now Auch, on the river Ger, which runs northward, and falls into the Garonne above Agen :—the Sotiates, in Sos, a district of Condomois :—the Lactorates, N. of the Ausci, on the left hand of the Garonne :—the Vasates, in the diocese of Bazas: —the Boii, in the vicinity of the river Sigmanus, now Archachon, a small bason on the sea-coast, into which the Loire falls, about 30 miles S.W. of Bourdeaux :—the Tarbelli, along the sea-coast between the settlements of the Boii and Pyrenean mountains :—the Bigerrones, in the diocese of Bigorre, at the foot of the Pyrenees :—the Convenæ, in the diocese of Cominge :—and the Consoranni, in the diocese of Conserans, on the border of Languedoc.

Gallia Belgica, or Belgic Gaul, was bounded, according to the division of Cæsar, on the W. by the Seine, on the E. by the Rhine, on the N. by the ocean, and to the S. undefined. Augustus added to this province the Sequani and Helvetii, who had formed a part of Gallia Celtica. Belgia Propria, distinguished from Belgica, as a part from the whole, included the settlements of the Bellovaci, Atrebates, and Ambiani, and reached to the sea-coast. Gallia Belgica was divided into Prima and Secunda, Germania Prima and Secunda, and Maxima Sequanorum.

Belgica Prima comprehended the greater part of Loraine and Treves, besides some adjacent districts ; and was inhabited by the Treveri, in the electorate of Treves :—the Mediomatrices, who anciently occupied a very extensive territory, but after the conquest of Gaul by Cæsar, they cannot be traced beyond their settlements in Belgica Prima. In the middle age Pagus Metensis was of the same extent with the diocese of Metz :—the Leuci, in Loraine, S. of the Mediomatrices, on the Moselle, towards Mons Vogesus, now Mont de Vauge :—and the Verodunenses, in Loraine, N. of the Leuci, on the river Mosa, or Meuse.

Belgica Secunda was situated between the river Meuse and the British channel ; and was occupied by the Remi, in the diocese of Laon, or N. part of Champagne :—the Catalauni, in the middle of Champagne :—the Suessiones, in the N. district of Isle de France :—the Veromandui, N. of the Suessiones, in the N.E. part of Picardy :—the Bellovaci, a numerous and powerful tribe, whose territories extended beyond the diocese of Beauvais :—the Silvanectes, on the left bank of the Oise, opposite to the Bellovaci :—the Ambiani, planted near the bank of the Samara, or Some, who held a distinguished rank among the Belgic tribes :—the Atrebates, N. of the Ambiani, in Artois :—the Morini, in a maritime territory, which comprehends the dioceses of Boulogne and St. Omer :—and the Nervii, a brave and powerful tribe, in the ancient diocese of Tournay, which included those of Gand (Ghent) and Bruges, and reached to the sea-coast.

Maxima Sequanorum included Franche Comté and a great part of Switzerland. It was occupied by the Sequani, the Helvetii, and the Rauraci ; which see respectively.

Germania Prima, or *Superior*, was a tract on the left bank of the Rhine, since called Alsace ; and was inhabited by the Triboci, who occupied the diocese of Stratburg :—the Nemetes, situated between the Vangiones and Triboci, in the bishopric of Spire, in Lower Alsace :—the Vangiones and Carcates, N. of the Nemetes, in the palatinate of the Rhine.

Germania Secunda, or *Inferior*, on the left bank of the Rhine, comprehended the duchy of Juliers, Luxembourg, Limbourg, Liege, and Brabant ; and was occupied by the Ubii, in the electorate of Cologne :—the Gugerni, a remnant of the Sicambri established by Augustus on this side of the Rhine, in a territory formerly occupied by the Menapii, between the Ubii and Batavi, in the small districts of Gueldres and Cleves :—the Eburones, in Liege and Limbourg, on both sides of the Meuse, who, after being exterminated, were succeeded by the Tungri :—the Sunici, Condrusi, Segni, and Paemani, in considerable tribes, which were cantoned along the skirts of Arduenna :—the Menapii, who occupied a territory sometimes called Pagus Monapiscus in Brabant, N. of the Toxandri, who were planted in the S. part of Brabant between the Scheldt and the Meuse :—and the Batavi, a branch of the Catti, who, being expelled their country, settled on the extremity of the coast of Gaul, and in an island formed by two branches of the Rhine and the sea. See BATAVI.

It is extremely difficult to distinguish the various tribes with which Gaul was peopled in the time of Cæsar, of Tacitus, or of Ptolemy. Modern nations are fixed and permanent societies ; but the tribes of Germany and Gaul were fluctuating associations of soldiers and savages : so that the same territory often changed its inhabitants in the tide of conquest and emigration. The same communities, uniting in a plan of defence or invasion, bestowed a new title on their new confederacy. The dissolution of an ancient confederacy restored to the independent tribes their peculiar but long-forgotten appellations. A victorious state often communicated its own name to a vanquished people. Sometimes crowds of volunteers flocked from all parts to the standard of a favourite leader : his camp became their country, and some circumstances of the enterprise soon gave a common denomination to the mixed multitude. The distinctions of the ferocious invaders were perpetually varied by themselves, and confounded by the astonished subjects of the Roman empire. Gibbon's Hist. Rom. Emp. v. 1.

The following *Table*, extracted from Playfair's Geography, exhibits

exhibits a comparative view of the ancient and modern political diviſion of Gaul.

Roman Provinces under Auguſtus.	Provinces under the French Monarchy.
1. Narbonenſis, I^{ma} . .	Languedoc,
	Conſerans,
	Comté de Foix,
	Rouſſillon.
2. Narbonenſis, II^{da}. . .	Part of Lower Provence,
	——— Upper Dauphiné,
3. Alpes Maritimæ . .	——— Eaſtern Provence,
	Nice,
	Monaco.
4. Lugdunenſis, I^{ma}. . .	Lyonois,
	Nivernois,
	Burgogne,
	Beaujolais,
	Forez,
	Part of Champagne.
5. Lugdunenſis, II^{da}. . .	Normandie,
	Vexin Français.
6. Lugdunenſis, III^{a}. .	Bretagne,
	Maine,
	Anjou,
	Touraine.
7. Lugdunenſis, IV^{a}. .	Mantois,
	Chartrain,
	Iſle de France,
	Brie,
	Part of Champagne,
	——— Bourgogne,
	——— Nivernois,
	——— Orleanois.
8. Aquitania, I^{ma}. . . .	Berri,
	Marche,
	Limouſin,
	Part of Poitou,
	Bourbonnais,
	Auvergne,
	Velay,
	Gevaudan,
	Rouergue,
	Alby in Languedoc,
	Quercy.
9. Aquitania, II^{a}. . . .	Part of Poitou,
	Angoumois,
	Saintonge,
	Perigord,
	Bordelais,
	Agenois,
10. Novempopulana . .	Landes,
	Bazadois,
	Condomois,
	Comminge,
	Bigorre,
	Bearn,
	Navarre,
	Gaſcogne.
11. Gallia Belgica, I^{ma}.	Territory of Treves,
	———— Luxembourg,
	Duchy of Gueldre,
	Meſſin,
	Toulounais,
	Lorraine,
	Barrois.
12. Belgica, II^{a}.	Laonois,
	Beauvoiſis,
	Noyonnais,
	Picardie,
	Artois,
	Flandre.
13. Maxima Sequanorum	Part of Bourgogne,
	——— Franche Comté,
	——— Switzerland.
14. Germania, I^{ma}. . .	Electorate of Mentz,
	———— Treves,
	———— Palatinate,
	Worms,
	Spire,
	Alſace,
	Some diſtricts in Swabia and in Switzerland.
15. Germania, II^{a}. . . .	United Provinces,
	Part of Weſtphalia, &c.
16. Gallia Viennenſis . .	Savoy,
	Vivarais,
	Dauphiné,
	Comtat-Venaiſſin,
	Part of Provence.

Playfair's Geog. vol. i. Anc. Un. Hiſt. vols. ix. xvi.

For a further account of Gaul, ſee Franks and France. For its principal mountains, ſee Alps; and an account of its rivers will be found under their ſeveral appellations, *Garamna*, *Sequana*, &c. or their Engliſh names, *Garonne*, *Seine*, &c. For an account of the original inhabitants of Gaul, their government, language, religion, &c. we refer to the articles Celts and Druids. After the conqueſt of Gaul by the Romans, its hiſtory will be blended with that of *Rome*, which ſee. See alſo the biographical articles Augustus and Cæsar.

GAULAN, Gaulon, or *Golan*, a town of Paleſtine, on the other ſide of Jordan, the capital of Gaulonitis, which was a diſtrict belonging to the half-tribe of Manaſſeh (Deut. iv. 43.), and extending from Peræa quite to Lebanon. This city was given to the Levitical tribe, of the family of Gerſhon, and became a city of refuge. (Joſh. xxi. 27.) It was the birth-place of Judas Gaulonites, chief of the Herodian ſect.

GAULEN, in *Geography*, a river which riſes in the north part of Norway, and, after a courſe of about twenty leagues weſtward, runs into the ſea about a league W. from Drontheim. In the year 1344 this river ſeemed to be drained; but by ſome means it paſſed under ground, from whence it emerged, and deſtroyed ſeveral churches, 48 farm-houſes, and 250 perſons.

GAULLY, a river of America, in Virginia, which riſes in a ſource that is unknown, and runs into the Kanhawa above the falls on the eaſtern ſide. N. lat. 37° 57′. W. long. 80° 58′.

GAULONITÆ, among the *Jews*, the name of a faction rather than a religious ſect, the ſame with the *Galilæans*. This political faction was raiſed up and headed by Judas Gaulonites, or Judas of Galilee, who is mentioned Acts, v. 37. Joſephus has called him in one place (Antiq. l. 18. § 1. p. 869. ed Haverc.) Judas Gaulanites, and in another place (Id. l. 20. c. 1. § 2. p. 965.) Judas of Galilee. Judas the Gaulonite and Judas of Galilee were, therefore, the ſame perſon; called

called by one or other of thefe names, becaufe Gaulona or Gaulonitis, his native country, which lay beyond Jordan, was otherwife called Galilee, or Galilee of the Gentiles, to diftinguifh it from the other Galilee on this fide of Jordan. (See GALILEE.) This Judas had raifed and headed an infurrection againft the Roman government, on occafion of the tax which Auguftus levied on Judæa, when he reduced it into the form of a Roman province. Judas became popular by either firft broaching or reviving the principle, that the Jews ought to obey none but God; and we learn from Jofephus (De Bell. l. ii. c. 8. § 1.) that Judas roufed their rebellious fpirit, by charging them with meannefs, if they could endure to pay tribute to the Romans, and acknowledge mortal men for their lords, after God had been their king. But notwithftanding the pretenfions of Judas, the Jews had before this time been fubject to mortal lords; for they had been tributary to the Romans in the reign of Herod; and even before Herod's reign, they had paid tribute to the Romans: for Jofephus fays (Ant. l. xiv. c. 11. § 2.) that "Caffius impofed a heavy tribute upon the people (in Syria); and in particular bore very hard upon Judæa, exacting of them 700 talents of filver." The Gaulonite faction was foon fuppreffed; and we read no more of it in the New Teftament, unlefs, as fome have conjectured, thofe perfons belonged to it, who were otherwife called Galileans, and whom Pilate flew as they were performing the facred rites at the altar, thus mingling their blood with their facrifices. Luke, xiii. 1.

GAULONITIS. See GAULAN.

GAULTHERIA, in *Botany*, named by Kalm in honour of a French phyfician fettled in Canada, whofe name was really *Gautier*, and who wrote an account of the fugar obtained from the maple, *Acer faccharinum*, publifhed in the Mem. etrangers de l'Acad. des Sciences de Paris, v. 2. 378, according to Dryander's Bibl. Banks, v. 3. 565.—Linn. Gen. 220. Schreb. 295. Willd. Sp. Pl. v. 2. 616. Ait. Hort. Kew. v. 2. 71. Mart. Mill. Dict. v. 2. Juff. 161. Lamarck Illuftr. t. 367. Gærtn. t. 63.—Clafs and order, *Decandria Monogynia*. Nat. Ord. *Bicornes*, Linn. *Ericæ*, Juff.

Gen. Ch. *Cal.* Perianth inferior, permanent, of one leaf, five-cleft, bell-fhaped; its fegments half-ovate. *Cor.* of one petal, ovate, flightly five-cleft; limb fmall, revolute. Nectary of 10 awl-fhaped, erect, very fhort bodies, furrounding the germen between the ftamens. *Stam.* Filaments 10, awl-fhaped, incurved, fhorter than the corolla, inferted into the receptacle; anthers with two cloven horns. *Pift.* Germen fuperior, roundifh, depreffed; ftyle cylindrical, the length of the corolla; ftigma obtufe. *Peric.* Capfule roundifh, obtufely pentagonal, depreffed, of five cells and five valves, opening at the top in five places, clothed all round with the perianth, become a roundifh, coloured berry, open at the fummit. *Seeds* numerous, nearly ovate, angular, bony.

Eff. Ch. Calyx inferior, five-cleft, permanent. Corolla ovate. Nectary of ten awl-fhaped points. Capfule of five cells, clothed with the pulpy calyx.

1. G. *procumbens.* Linn. Sp. Pl. 565. Andr. Repof. t. 116.—Leaves obovate, pointed, flightly ferrated, fmooth, crowded about the tops of the branches. Stems afcending, wavy, naked.—Found by Kalm in barren fandy ground in Canada. It is eafily cultivated with us in a light fandy loam, with a mixture of peat earth, and is very hardy, bearing flowers and fruit moft part of the year. The *roots* are moderately creeping. *Stems* procumbent in their lower part, then afcending, fubdivided, wavy, fomewhat angular, fmooth, woody, naked except about the top, where they bear a few fcattered, evergreen, broadifh obovate *leaves*, paler beneath, on fhort thick ftalks. *Flowers* axillary, folitary, ftalked, drooping, white, with a reddifh calyx, which becomes a fcarlet fpongy berry. Every part of the plant has more or lefs of an aromatic flavour, like fyrup of capillaire, with fome aftringency. A few of the leaves are faid to communicate an agreeable perfume to tea. The two fcales at the bafe of each flower are rather bracteas than an outer calyx, as appears by the analogy of other plants in this order, and their appearance after flowering.

2. G. *antipoda.* Forft. Prod. 34.—"Leaves fcattered, roundifh, with tooth-like ferratures. Stem fhrubby, diffufe."—Native of New Zealand. *Forfter.*

Mr. R. Brown, in his valuable *Prodromus*, v. 1. 559, has propofed to augment this genus with the *Andromeda rupeftris* of Forfter, and feveral American plants, hitherto referred to *Andromeda*. We have not had fufficient opportunity to examine into the propriety of this meafure. Another indubitable fpecies, however, is

3. G. *erecta.* Venten. Jard. de Cels, t. 5.—Leaves ovate, pointed, finely ferrated, fcattered. Stem erect. Flowers in long hairy clufters.—Native of Peru. *Ventenat.* It conftitutes the underwood of the pine forefts on the weft coaft of North America. *Mr. A. Menzies. Stem* fhrubby, branched, leafy, erect, 18 inches to three feet high; the branches hifpid. *Leaves* an inch and half or two inches long, broad-ovate, with minute fharp ferratures; dark-green and fhining above; paler and roughifh beneath. *Clufters* three inches long, hairy, vifcid, with broad, concave bracteas. *Flowers* bright red, drooping. *Berry* red.—Ventenat fays the late Mr. Cels received this fhrub in 1792, and kept it in his greenhoufe. From Mr. Menzies' information, it may be prefumed capable of bearing our climate, and of growing under the fhade of evergreens; a very defirable property. We have not feen it alive in England.

GUALTIER, ST., in *Geography*, a town of France, in the department of the Indre; and chief place of a canton in the diftrict of Le Blanc; 15 miles S.W. of Chateauroux. The place contains 962, and the canton 5,417 inhabitants, on a territory of $327\frac{1}{2}$ kiliometres, in 10 communes.

GAULUS, in *Antiquity*, a fhip of a roundifh form, moftly ufed by the people of Phœnicia.

GAULUS alfo fignified a kind of cup.

GAUN, a term provincially applied to the gallon meafure, and fometimes to a fmall tub.

GAUNA, in *Ancient Geography*, a town of Afia, in Media. Ptol.

GAUNERSDORFF, in *Geography*, a town of Auftria, 16 miles N.N.E. of Vienna.

GAUNLASSE, a river of England, in the county of Durham, which runs into the Wear at Bifhop's Auckland.

GAVNOE, in fmall ifland of Denmark, near the S.W. of Zealand. N. lat. 55° 12'. E. long. 11° 53'.

GAUNT-BELLIED, in *Rural Economy*, a term applied to fuch animals as are drawn up fmall or thin in their bellies: when horfes have this appearance, they are fuppofed to be wafhy, tender, and unhealthy, confequently of but little value for hard labour, or any other purpofe. In the removal of this ftate there is feldom much to be accomplifhed, but fuch animals fhould be fed as little as poffible with any fort of dry fodder. Grafs and other kinds of moift food are conftantly the moft proper.

GAUNTLET. See GANTLET.

GAVOTTA, or GAVOTTE, derived from the *Gavots*, a people inhabiting a mountainous diftrict in France, called Gap, in *Italian Mufic*, is a kind of dance, the air of which has two ftrains, brifk and lively, and in common time: each of its ftrains are played twice over; the firft has ufually four or

 eight

eight bars, and the fecond contains eight, twelve, or more. The time begins with a minim, or two crotchets, or notes of equal value, and the hand rifing; and ends with the fall of the hand upon the dominant, or mediant of the mode, never upon the final, unlefs it be a rondeau. And the laft begins with the rife of the hand, and ends with the fall upon the final of the mode.

The Gavots of Corelli, Albinoni, Vivaldi and others of the Italians, correfpond with thefe rules as far as they relate to the meafure, the number of bars in each ftrain, and the cadences; but in refpect to the initial notes of the air they deviate from it; for they fometimes begin with a whole bar, and fometimes with an odd quaver. Cotgrave, in his Dictionary, defines Gavote a kind of Brawle, danced commonly by one alone.

GAVOTTA, *Tempo di*, is when only the time or movement of a gavotte is imitated, without any regard had to the meafure or number of bars, or ftrains. We often find parts of fonatas which have this phrafe to regulate their motions.

GAUPP, JOHN, in *Biography*, an able divine and mathematician, was born at Lindau, in Swabia, in the year 1667. Here he received the early parts of his education, from whence, at the age of 15, he was fent to Ulm. From Ulm he went to the univerfity of Jena, where he took the degree of M.A. and became a confiderable proficient in mathematics. After this he fpent fome time in different German univerfities, improving himfelf in theology and mathematics, and then vifited Amfterdam and London. In 1693 he was admitted to the office of the miniftry, in which he rofe to the ftation of principal paftor of Lindau, about the year 1728. As much of his time as he could fpare from the duties of the paftoral office he devoted to mathematical and philofophical purfuits, and became a lecturer in thefe branches of fcience. He foon attained fuch a rank among the philofophers of the age, as to be honoured by the correfpondence of many of the moft learned mathematicians in foreign countries. He was a practical mechanic, as well as an able illuftrator of the higher branches of fcience, and many of the inftruments which he made ufe of in his obfervatory, and in his experimental refearches, were conftructed by himfelf. He had begun the erection of an obfervatory, but death terminated his labours in 1738. He was the author of "Gnomonica Mechanica Univerfalis:" of various calendars, and calculations and defcriptions of eclipfes: of other philofophical treatifes, and of fermons. His Ephemerides and aftronomical obfervations were received by the Royal Academies of Sciences at Paris and Berlin, and feveral of them were inferted in the Memoirs of thofe learned focieties. Moreri.

GAUR, or ZOUF, in *Geography*, a city of Afia, and capital of a fmall kingdom or ftate, in the fouthern part of Greater Bucharia, feparated by mountains from Cabul and Candahar. This city was taken by Mamood I., and in 1009 annexed with its territory to Ghizni. It is faid to be now fubject to the kingdom of Candahar: 150 miles S.W. of Balk. N. lat. 34° 40'. E. long. 63° 54'. The mountains of Gaur on the N. and N.W. of Candahar, are probably the Paropamifus of antiquity; and they have no connection with the chain of Caucafus, as the ancients fuppofed.

GAURA, in *Botany*, from γαυρος, *pompous* and *elated*; a tall fhewy plant. Linn. Gen. 187. Schreb. 250. Willd. Sp. Pl. v. 2. 311. Mart. Mill. Dict. v. 2. Ait. Hort. Kew. v. 2, 4. Juff. 319. Lamarck Illuftr. t. 281. Gærtn. t. 127.—Clafs and order, *Octandria Monogynia*. Nat. Ord. *Calycanthemæ*, Linn. *Onagræ*, Juff.

Gen. Ch. *Cal.* Perianth of one leaf, fuperior, deciduous; tube cylindrical, long, thickeft at the bafe, containing four obfolete, oblong, attached glands; limb in four deep, oblong, acute, reflexed fegments. *Cor.* Petals four, inferted into the tube of the calyx, oblong, directed towards the upper fide, equal, with narrow claws. *Stam.* Filaments eight, thread-fhaped, broadeft towards the extremity, with an obfolete, conical, nectariferous gland withinfide of the bafe of each; anthers oblong, verfatile. *Pift.* Germen inferior, oblong, of four cells, with the rudiments of feveral feeds affixed to the central columnar receptacle; ftyle thread-fhaped, as long as the ftamens; ftigmas four, round, ovate, fpreading. *Peric.* Drupa dry, fquare, tapering at each end, its angles dilated and compreffed, of four cells, three of which are ufually abortive. *Seed* folitary, oblong, angular.

Eff. Ch. Calyx four-cleft, tubular. Corolla of four petals, turned upward. Drupa dry, inferior, quadrangular.

1. G. *biennis*. Linn. Sp. Pl. 493. Curt. Mag. t. 389.—Leaves lanceolate. Stem herbaceous. Stamens and ftyle pendulous.—Native of Virginia and Pennfylvania. A hardy biennial plant in our gardens, flowering from Auguft to October, and when the autumn is favourable, propagating itfelf copioufly by feed. The *ftem* rifes to the height of fix or eight feet, and is leafy, much branched. *Leaves* alternate, foft, bluntly toothed. *Flowers* extremely numerous, in denfe corymbofe terminal clufters, elegantly confpicuous on account of their red calyx and white petals.

2. G. *fruticofa*. Jacq. Ic. Rar. v. 3. t. 457.—Leaves linear-lanceolate. Stem fhrubby. Stamens and ftyle direct.—Native of South America. Jacquin and Willdenow have well diftinguifhed this from the former, on account of its fhrubby ftem, fmooth and narrow leaves; and flowers not a quarter fo large, whofe corolla is not fo much expanded, and whofe ftamens and ftyle are prominent, not pendulous. The colours of the parts agree.

The *Gaura mutabilis* of Willdenow and Cavanilles, figured in Curt. Mag. t. 388. by the name of *Oenothera anomala*, is, at beft, a very doubtful *Gaura*. According to the account and figure of the ripe fruit in Cavanilles, Ic. v. 3. 30. t. 258, it feems indeed to agree; but the fection of the germen in Curtis is rather that of an *Oenothera*, with which latter its flower perfectly accords. Curtis's hint of its being probably a genus diftinct from both, is perhaps neareft the truth.

GAURA, in *Geography*, a town of Peru, in the jurifdiction of Chançay, containing about 200 houfes, and two churches, fituated in a fertile country, and watered by a river of the fame name. Its chief commerce is in falt and falt beef.

GAURA *Mons*, in *Ancient Geography*, a mountain mentioned in the Itinerary of Jerufalem, between Mons Seleucus, and Lucus, fituated, as M. D'Anville conjectures, in Dauphiné.

GAURANUM PROMONTORIUM, a promontory of Affyria, near the mouth of the Tigris.

GAVRAY, in *Geography*, a town of France, in the department of the Channel, and chief place of a canton in the diftrict of Coutances; 9 miles S. of Coutances. The place contains 1823, and the canton 14,806 inhabitants, on a territory of 162½ kiliometres, in 15 communes.

GAURBEND. See GHOURBEND.

GAURIANISI, a fmall ifland in the Grecian Archipelago, W. of Andros. N. lat. 37° 52'. E. long. 24° 50'.

GAURITZ RIVER, a river of Africa, on the fouth coaft of the colony of the Cape of Good Hope, which is a collection of water from the Great Karroo plains, the Black mountains, and the chain that runs parallel and neareft to the fea-coaft. The branches to the northward of this chain are periodical, but it flows to the fouthward, throughout the year, though in the fummer months with a very weak current. In the rainy feafon it is confidered as the moft rapid and

and dangerous river in the whole country. Its mouth opens into the sea, where the coast is straight, and it is crossed by a bar of sand, which, in summer, is generally dry.

GAURES, or rather *Gavres*, or *Gabres*. See GABRES.

GAURUS, in *Ancient Geography*, a mountain of Italy, in Campania.

GAUSAPHNA, a town of Africa Propria, named also *Gazauphala*. Ptol.

GAUSWANNY, in *Geography*, a town of Hindoostan, in the circar of Gohud; 30 miles N.W. of Narna.

GAUT, or GHAUT, signifies in India either a pass through mountains, or a landing place on the bank of a river; but in a more extensive sense it is applied to the mountains themselves; and as the Mysore country is a kind of table land, or tract elevated above the rest of the peninsula, the term is particularly applied to that country.

The *Gauts*, peculiarly so called, are ranges of mountains, which run along the east and west coasts of the Deccan; the latter being called by the natives the mountains of Sukhien. These mountains rise abruptly from the low country, particularly on the west side, towards the sea, forming, as it were, a stupendous wall of mountains, and supporting, like a terrace, a vast extent of fertile and populous plains, which are so much elevated as to render the air cool and pleasant. This elevated tract is continued not only through the Mahratta territories, but extends through the peninsula, to the southern extreme of Mysore; and it is named "Balla-Gaut," through its whole extent, denoting literally the "Higher, or Upper Gauts;" or perhaps more correctly the countries lying *above* or *below* the Gauts. In the peninsula it is applied in contradistinction to "Payen-Gaut," or the "Lower Gauts;" but in the Deccan it seems to be used only as a proper name. Opposite to Paniany, on the western coast, there is a break or interruption of the mountains, about 16 miles in breadth, occupied chiefly by a forest. Exclusively of this gap, the mountains of Sukhien extend from cape Comorin to Surat, at unequal distances from the coast; seldom more than 70 miles, and commonly about 40; and within one small space only. This range approaches within six miles. The ridge, which we are now describing, does not terminate in a point or promontory, when it approaches the Tapty, or Surat river; but, departing from its meridional course, bends eastward, in a wavy line, parallel to the river, and is afterwards lost among the hills, in the neighbourhood of Burhanpour. In its course along the Tapty, it forms several passes, or descents (that is, *gauts*) towards that river; whence the country into which the passes descend was originally named Candeish, or the low country. The ridge also seems to abate of its great height, after passing the parallel of Basseen, northward. (See BUGLANA.)

This famous Apennine marks, perhaps with more precision, as Mr. Rennell observes, than any other boundary whatever, the line of summer and winter, or rather of dry and wet, and extends 13 degrees of latitude. Although the precise altitude of these mountains has not been ascertained, yet being from 3000 to 4000 feet, it is sufficient for preventing the great body of clouds from passing over them; and accordingly the alternate N.E. and S.W. winds, called the monsoons, occasion a rainy season on one side of the mountains only: that is, on the windward side. It would appear, however, that during the first part of the rainy monsoon, on the Malabar coast, (*i. e.* May and June,) a considerable quantity of rain falls in the upper region, or table land of Mysore, &c.; but it is supposed that this weather is rather of the nature of the periodical rains within the tropics, than of the proper monsoons. Be this as it will, there is no doubt that great quantities of clouds pass over the western edge of the Gauts. But the quantity of rain that falls *above*, does not bear any kind of proportion to that which falls *below*, the Gauts. Mr. Rennell concludes that the region of the Gauts shelters only a particular tract; beyond which, the light and elevated clouds which pass over it descend in rain. Madras is within the limits of the sheltered tract, though at least 300 miles to the leeward of the Gauts. It has been, till of late, a general opinion, that the Gauts extended from the Northern, or Bootan mountains, to cape Comorin; and occasioned a diversity of seasons at one and the same time throughout all India. But the truth is, that different seasons exist at the same moment, only in a part of the peninsula; for in the parallel of Surat the cause ceases; the S.W. wind, no longer opposed by a wall of mountains, carrying its supply of moisture uninterruptedly, both far and near, over the whole face of the country. Rennell's Memoir.

GAUTHIER, or GAULTIER, JOHN BAPTIST, in *Biography*, was born at Louviers, in the diocese of Evreux, in the year 1685. He was from early life attached to the study of theology, but, in obedience to the wishes of his parents, he commenced the study of the law; finding, however, his dislike to that study insurmountable, he was permitted to follow his inclination, and entered, in the year 1704, on a course of theology, in the schools of the Sorbonne. Having finished his early studies, he was admitted to deacons' orders, and commenced a series of catechetical lectures to young people, and of conferences for the instruction of junior ecclesiastics. His diligence and ability attracted the notice of M. le Normand, bishop of Evreux, who took him into his family, where he applied himself to the study of ecclesiastical antiquities. In 1713, he was, by the intrigues of the Jesuits, obliged to quit the diocese of Evreux, and was received into the house of M. de Langle, bishop of Boulogne. By that prelate he was admitted into priests' orders, and after taking his degrees in law, he was nominated to the canonry of his cathedral: he afterwards made him his proctor, and vicar-general, because Gauthier's sentiments proved a bar to his elevation in the church. From this time M. Gauthier was the bosom friend of his patron and benefactor, who, in a great measure, submitted himself to his advice in the concerns of his diocese. The bishop likewise availed himself of his pen in various publications, particularly in the "Letters and Memoirs," which he printed during his dispute with the archbishop of Rheims. Upon the death of M. de Langle, Gauthier entered into the service of M. Colbert, bishop of Montpellier, as librarian, a character which was intended to conceal the more intimate connection that subsisted between them; for till the death of M. Colbert, Gauthier was his chief adviser in all ecclesiastical matters, his private chaplain, and confidential secretary. He then went to Paris, where he spent the remainder of his days in literary employment. He died in 1755, in consequence of an injury which he sustained by the overthrow of a carriage as he was travelling from Evreux to Paris, when he was seventy-one years of age. His publications were extremely numerous, chiefly on theological subjects. The titles of them all are given in Moreri, to which the reader is referred.

GAUTTY, in *Geography*, a town of Bengal; 28 miles W. of Nagore.

GAUTUMPOUR, a town of Hindoostan, in Oude; 20 miles W. of Corah.

GAW, in *Mining*, signifies a *Fault*, in parts of Yorkshire and some other places. See that article.

GAWAITTAN, in *Geography*, a town of Pruffia, in Samland; 7 miles W. of Goldap.

GAWILE, or GYALGUR, a town of Hindooftan, in Goondwana; 20 miles N.N.W. of Ellichpour. N. lat. 21° 27'. E. long. 77° 58'.

GAWNAGH, LOUGH, a lake of Ireland, in the northern part of the county of Longford, near the borders of Cavan.

GAWRAH, a town of Hindooftan; 5 miles N.E. of Benares.—Alfo, a river of Afia, which rifes in the mountains of Kemaoon, and runs into the Ganges with the Ramgouga.

GAWSE, or GAWZE, in the *Manufactures*, a very thin, flight, tranfparent kind of ftuff, woven fometimes of filk, and fometimes only of thread.

To warp the filk for making of gawze, they ufe a peculiar kind of mill, upon which the filk is wound: this mill is a wooden machine, about fix feet high, having an axis perpendicularly placed in the middle thereof, with fix large wings, on which the filk is wound from off the bobbins, by the axis turning round.

When all the filk is on the mill, they ufe another inftrument to wind it off again on two beams: this done, the filk is paffed through as many little beads as there are threads of filk: and thus rolled on another beam, to fupply the loom.

The gauze-loom is much like that of the common weavers, though it has feveral appendages peculiar thereto.. See LOOM.

There are figured gauzes; fome with flowers of gold and filver, on a filk ground, thefe laft are chiefly brought from China.

GAWZYGUR, in *Geography*, a town of Hindooftan, in the circar of Gohud; 30 miles N.W. of Narwa.

GAY, a term fignifying fpeckled or light coloured in cattle.

GAY, JOHN, in *Biography*, an eminent Englifh poet, was born in 1688, at Barnftaple, in Devonfhire, where he was educated with a view to trade. He was accordingly put out as an apprentice to a filk-mercer, in London. He foon fhewed an utter diflike to the duties enjoined on him in this fituation; and in a few years a mutual feparation took place between him and his mafter. From this time he feems to have devoted himfelf to poetical compofition; and, in 1711, he publifhed his "Rural Sports," infcribed to Pope. This compliment, joined to the excellent temper of Gay, laid the foundation of mutual friendfhip, which death only could divide. In 1712, Gay accepted the offer of refiding with the duchefs of Monmouth, in quality of her fecretary: this fituation afforded him fufficient leifure to purfue the bent of his own inclinations, and in the courfe of the year he gave to the world a poem, entitled "Trivia, or the Art of walking the Streets of London." This little work difplayed in a ftriking manner the talent which its author had for making obfervations, and which gave him an originality beyond what his powers of invention, properly fo called, could have effected. About the fame time, he engaged in dramatic writing. The "Mohocks, a tragicomical farce," was attributed to his pen; and he brought out a comedy, called "The Wife of Bath." In 1714, Gay appeared as the advocate of his friend Pope, in a difpute between him and Ambrofe Phillips, refpecting the merits of their paftorals: thofe of Pope were written in polifhed, and thofe of Phillips in the ruftic ftyle. Gay, to ferve his friend, undertook to compofe a fet of burlefque paftorals, in which the manners of the country fhould be exhibited in their natural coarfenefs, with a view of proving, by a fort of carricature, the abfurdity of Phillips' fyftem of paftorals. His work was entitled "The Shepherd's Week," as the fix pieces of which it confifted were denominated by days of the week. They proceed through the common topics of a fet of paftorals in a humorous ftrain of parody; neverthelefs his pictures of rural life and its accompanying fcenery were fo natural and amufing, and intermixed with circumftances fo truly beautiful and touching, that they proved the moft popular works of the kind in the Englifh language. Gay dedicated his work to lord Bolingbroke; and at this period he feems to have enjoyed a large fhare of favour from the Tory party then in power. He was appointed fecretary to the earl of Clarendon, in his embaffy to the court of Hanover. Upon the death of the queen his profpects were damped; but he made fome efforts to obtain the favour and patronage of the new family; the experiment did not fucceed. He wrote a poetical epiftle upon the arrival of the princefs of Wales, which compliment procured him the honour of the attendance of the prince and princefs, at the exhibition of his next dramatic piece. Gay had many friends among perfons of rank and opulence, and he was generally efteemed for the excellent qualities of his heart, yet nothing was done towards fixing him in a ftate of independence. He publifhed a collection of poems, in 1720, by fubfcription, by which he gained a thoufand pounds, and a prefent of fome fouth-fea ftock from Craggs, fecretary of ftate, which raifed his hopes of fortune to a confiderable height; but by refufing to fell his ftock at the critical period, he loft the whole, and was fo dejected by his difappointment as to be thrown into a dangerous ftate of ill health. He retired to Hampftead for the air; and by this and the kindnefs of his friends he recovered, and wrote the tragedy of "The Captives," which was acted in 1723. His next work was his "Fables," written profeffedly for the inftruction of the duke of Cumberland, to whom it was dedicated. This was publifhed in the year 1726. A fecond part of the Fables, directed to political fubjects, was publifhed after Mr. Gay's death, but it did not take with the public; whereas the Fables, properly fo called, have been reprinted in almoft a thoufand different forms. The poet naturally expected a handfome reward for this performance; but upon the acceffion of George II., though not wholly forgotten, he was offered nothing better than the poft of gentleman-ufher to the young princefs Louifa, which he declined, by faying he was too old for fuch a place. Solicitations were made afterwards in his behalf, but he was ftill unfuccefsful, and his hopes at court came to an end. He left the purlieus of the palace, and finding that he muft depend on himfelf for his future fupport, he began to devife plans for the purpofe. In 1727, he brought out his famous "Beggar's Opera," which was refufed at Drury-lane; but when it did appear on the ftage, it was, after once or twice performing, received with unbounded applaufe: it was the leading topic of the town, and upwards of fixty fucceffive reprefentations were infufficient to fatiate the metropolis. It was likewife acted with equal popularity at all our country theatres. "If," fays an able critic, "the caufe of this extraordinary fuccefs be enquired, the anfwer is perhaps not very obvious. But it feems to indicate a kind of coarfenefs in the national tafte, which could be delighted by the repetition of popular ballad tunes, and the delineation of fcenes of vice and vulgarity, painted indeed in a natural ftyle, and in their incidents appealing to the feelings implanted in every human breaft. But if the Beggar's Opera obtained applaufe on the ftage, it underwent more ferious cenfure in other places than almoft any dramatic piece that has

has been exhibited. By making a highwayman the hero, and bringing him off in a kind of triumph, the author has been charged with rendering the character of a freebooter an object of popular ambition; and by furnishing his personages with a plea for their dishonesty, drawn from the universal depravity of mankind, and particularly of those in offices of authority, he has been accused of sapping the foundations of all social morality. It cannot be denied that such is the manifest tendency of the piece in its principles; but whether a mere spectacle is capable of producing important effects upon the public morals, may be questioned. That Gay himself had no mischievous intentions in writing it, is highly credible; and his friend Swift warmly defended it as a wholesome satire against the corruption of the times."

Government, it is imagined, thought unfavourably of the tendency of the Beggar's Opera, inasmuch as they prevented the representation of the second part of it, which was written and published under the title of "Polly." For the injury which he sustained in the suppression of this piece, he was amply compensated by the sale of the publication, and by the patronage of the duke of Queensbury, who took him into his house and shewed him every kindness. Raised above the pressure, or the fear of want, he fell into a dejected state of spirits, and was in other respects much out of health; but in the happier intervals, he produced his "Acis and Galatea," and the opera of "Achilles." He died in December, 1732, at the age of forty-four, sincerely lamented by his friends; and his memory was honoured by a monument in Westminster Abbey, where his remains were deposited, and an epitaph was written by Pope. He possessed but little energy of mind, and had too much indolence to support that independence, which he was ever desirous of asserting. Gay was author of some other pieces besides those already noticed, and of two ballads generally known, *viz.* "All in the Downs," and "'Twas when the Seas were roaring." Biog. Brit. Lives of the Poets.

GAY *Head*, in *Geography*, a kind of peninsula, in America, on Martha's vineyard, between three and four miles in length, and two in breadth, and almost separated from the other part of the island by a large pond. The Indians, inhabiting this part, lately numbered, amounted to 203. The soil is good, and with cultivation will produce most vegetables. Traces are perceived of former volcanoes on this peninsula. N. lat. 41° 20'. W. long. 70° 50'.

GAYA, or KYGOW GAYA, a town of Moravia, in the circle of Hradisch; 14 miles W.S.W. of Hradisch. N. lat. 48° 59'. E. long. 17° 2'.

GAYA, a town of Hindoostan, in the country of Bahar; 50 miles S. of Patna. N. lat. 24° 46'. E. long. 85° 8'.—Also, a river of Spain, from which Scipio formed an aqueduct to Tarragona.—Also, a small island in the East-Indian sea, near the east coast of Borneo. N. lat. 4° 46'. E. long. 118 48'.

GAYAC. See GUAIACUM.

GAYACH, in *Geography*, a river of Bavaria, which runs into the Danube, 5 miles W. of Passau.

GAYETA, a town of Spain, in Valencia; 30 miles S. of Valencia.

GAYLAH, a town of Hindoostan, in Oude; 8 miles S. of Bansey.

GAYMENT, Fr. has been said to be equal to *Allegro*, Ital. chearful, lively, quick; but the French word, as Rousseau has well observed, is not so extensive in its signification, being confined to chearful, light, airy strains alone; whereas allegro extends to quick movements of all kinds of character and expression.

GAZA, THEODORE, in *Biography*, a learned modern Greek, who flourished in the 15th century, was born at Thessalonica. After the destruction of his native city, in 1430, by the Turks, he took refuge in Italy, and studied the Latin language with such diligence, that in three years he was so thoroughly acquainted with it as to become one of the most eloquent writers in his time. From 1441 to 1450 he was a professor in the university of Ferrara, and afterwards its principal rector. Before this he was in a state of extreme indigence, and was obliged to copy Greek manuscripts for a livelihood. From Ferrara he went into the service of pope Nicholas V., and at the same time obtained the patronage of cardinal Bessarion, who made him his confidential friend. Upon the death of the pope he was some time with king Alphonso at Naples, upon whose decease he returned to Rome. His patron cardinal Bessarion procured him a rich benefice in Calabria, but being inattentive to his own affairs, he was still in but depressed circumstances. At the instance of Nicholas V. he undertook a translation of Aristotle's work on animals, which was not finished till the reign of Sixtus IV., to whom he presented it, and expected no doubt a handsome remuneration, instead of which he was mortified with a present of fifty crowns only, which, it is said, so enraged him that he actually threw the money into the Tyber. After this he returned to Ferrara, and from thence to Calabria, where it is probable he died in 1478. Gaza was one of the most learned men of his time, and his great talents have been celebrated by the principal scholars among his contemporaries. His works are "A Greek Grammar," printed by Aldus in 1495, together with his treatise "On the Grecian Months." Besides the work already noticed of Aristotle, he translated the Aphorisms of Hippocrates: Theophorastus on Plants: Ælian's Tactics: Dionysius Halicarn. de Compositione Orationis: the Homilies of John Chrysostom, and some other works. He translated Cicero de Senectute, and other pieces from Latin into Greek; and in the controversy between the Platonists and Aristotelians he composed a work against the notions of the former. Gen. Biog.

GAZA, in *Ancient Geography*, one of the five Philistine satrapies or principalities, situated towards the southern extremity of Canaan, about 15 miles S. of Ascalon, four or five N. of the river Bezor, and at a small distance from the Mediterranean. It was placed on an eminence, surrounded by beautiful and fertile vallies; watered by the above-mentioned river and a number of other springs, and, at a further distance, encompassed on the inland side with hills highly cultivated. It was strong, on account of its situation, and also by means of the walls and stately towers that surrounded it. It was, however, taken by Caleb, then chief of the tribe of Judah, or assigned to this tribe by Joshua; but soon after regained by its inhabitants; and held by them till Samson carried off the gates of it in the night. (Josh. xv. 47. 1 Sam. vi. 17.) It often changed masters, and passed from the Philistines to the Jews, from them to the Chaldeans, who conquered Syria and Persia, afterwards to the Persians, who held it, when Alexander besieged, took, and destroyed it. It was afterwards possessed by the kings of Egypt. Antiochus the Great took and sacked it; it was taken several times from the Syrians by the Maccabees; taken and destroyed by Alexander Jannæus, king of the Jews; repaired by Gabinius; and given by Augustus to Herod the Great; but not subject to his son Archelaus. The evangelist Luke says (Acts, viii. 26.) that, in his time, Gaza was a desert place. Some geographers make Gaza a sea-port, confounding

ing it with New Gaza, or Majuma; and others place it at a great diftance from the fea. Calmet has erroneoufly made this diftance 20 miles; whereas Arrian ftates it at 20 furlongs or 2½ miles.

New Gaza, or Majuma, was the ancient fea-port to the former, and on that account a place of fome note; but much more fo in the reign of Conftantine the Great, who called it Conftantia from the name of his fon Conftantius, and endowed it with many fingular privileges, of which it was deprived by Julian the Apoftate. Majuma ftood near the mouth of the river Bezor, about 10 miles fouth of Afcalon, and as many N.W. of Anthedon; it has ftill fome curious antiquities remaining; but it is not eafy to fay whether they belonged originally to New or Old Gaza.

Gaza, now called by the Arabs "Razza," is compofed of three villages, one of which, under the name of the "Caftle," is fituated between the two others, on an inconfiderable eminence. This caftle is now a mere heap of rubbifh. The Serai of the Aga, which conftitutes a part of it, is in a ruinous ftate; but it has the advantage of a moft extenfive profpect. From its walls may be feen the fea, from which it is feparated by a fandy beach, a quarter of a league wide; and the adjacent country refembles Egypt, by means of its date trees, and flat afpect; and in this latitude, the foil and climate both appear to be truly Arabian. The heats, the drought, the winds, and the dews, are the fame as thofe of the banks of the Nile; and the inhabitants have the complexion, ftature, manners, and accent of the Egyptians, rather than thofe of the Syrians. The fituation of Gaza, by its convenience for commerce, has rendered it at all times a town of fome importance. The ruins of white marble fometimes found there prove that it was formerly the abode of luxury and opulence; nor was it unworthy of this preference. The black foil of the furrounding country is extremely fertile, and the gardens, watered by limpid ftreams, ftill produce, without art, pomegranates, oranges, exquifite dates, and ranunculus roots, in great requeft, even at Conftantinople. It has, however, fhared in the general deftruction; and notwithftanding its proud title of the capital of Paleftine, it is no more than a defencelefs village, peopled by at moft only 2000 inhabitants. The manufacture of cottons is their principal fupport; and as they have the exclufive fupply of the peafants and Bedouins of the neighbourhood, they employ about 500 looms. Here are likewife two or three foap manufactories. The commodity of afhes, or kali, was formerly an article of confiderable commerce; thefe afhes are procured by the Bedouins, who burn the plants of the defert; but fince the Aga has monopolized this commodity, and the Arabs are compelled to fell it at his price, they are no longer anxious to collect it; and the inhabitants, conftrained to purchafe at his pleafure, neglect the manufacture of foap. Another branch of commerce, more advantageous to the people of Gaza, is furnifhed by the caravans, which pafs and repafs between Egypt and Syria. The provifions which they are obliged to take for their four days' journey in the defert occafion a confiderable demand for their flour, oil, dates, and other neceffaries. Sometimes they correfpond with Suez; they likewife fit out every year a great caravan, which goes to meet the pilgrims of Mecca, and conveys to them the convoy of Paleftine, and fupplies of various kinds. They meet them at Maon, four days' journey to the S.S.E. of Gaza, and one day's journey to the N. of Akaba, on the road to Damafcus. They alfo purchafe the plunder of the Bedouins, which is occafionally an article of great value. Beyond Gaza there are only deferts, with fome cultivated fpots and villages along the fea-coaft. Gaza, however, fuffers, in common with other places, by the fands which daily accumulate; infomuch that many places which were anciently fea-ports, are now four or five hundred paces within land; and this is the cafe with refpect to Gaza. N. lat. 31° 25'. E. long. 35° 40'. In 1799 Gaza was taken by the French. Anc. Un. Hift. vol. ii. Volney's Travels in Egypt and Syria, vol. ii.

Gaza, or *Ganzaca*, *Tebriz* or *Tauris*, a town of Afia, which held the firft rank in Media Atropatena. It was the depofitory of great wealth, and the fummer refidence of the kings of Atropatena. It was fituated N.E. of the lake Spauta, and at fome diftance from it.

Gaza *Giovane*, in *Ornithology*, the name of a fmall fpecies of heron, of a fine white colour, the *Ardea Garzetta*. See Garzetta and Heron.

GAZALI, in *Biography*, furnamed *Abou Hamed Mohammed Zein Eddin Al Thoufi*, one of the moft celebrated of the Muffulmen doctors, was born at Thous, a town in Khorafan, in the year 450 of the Hegira, or 1072 of the Chriftian era. He was appointed profeffor of the college founded at Bagdat, but foon relinquifhed the duties of the fituation for the fake of embracing a life of retirement and ftudy, and after having made a pilgrimage to Mecca, he returned to his native country, where he died in the year 504 or 505. He obtained a high reputation for learning and virtues, which occafioned him to be diftinguifhed in the oriental manner by many magnificent titles. Being afked what means he had ufed to arrive at that eminence in fcience to which he had attained, he replied, "that he had never been afhamed to afk for information on fubjects concerning which he had been ignorant." He was author of many works, but his principal production was entitled "The different Claffes of the fciences which relate to Religion." Gen. Biog.

GAZE-Hound. See Hound.

GAZEEDEEN, in *Geography*, a town of Hindooftan; 14 miles E. of Delhi.

GAZELLA, or Gazelle, a fpecies of *Antelope*, which fee.

GAZER, or Gazara, in *Ancient Geography*, a town of Paleftine, belonging to the tribe of Ephraim, fituated on the torrent of Gaas, S.W. of Bethel. It was given to the Levites of the family of Kohath. (Jofh. xxi. 21.) In the time of Solomon, Pharaoh, king of Egypt, took and burnt it; but it was rebuilt by Solomon. At a future period, it was taken by Judas Maccabæus, and fortified by his brother Jonathan. Jofeph. Ant. l. xiii. c. 11.

Gazer, in *Geography*, a town of Africa, in the country of Afben; 50 miles N. of Afouda.

GAZETTE, a news-paper, or printed account of the tranfactions of divers countries, in a loofe fheet or half-fheet.

The word is formed from *gazetta*, a kind of coin, formerly current at Venice, which was the ordinary price of the firft news-paper printed there: though others derive it, by corruption, from the Hebrew *izgad*, which fignifies *nuntius*, a meffenger, but this etymology is too much forced.

Gazettes, which moft people look on as trifles, are by fome held the moft difficult kind of compofitions that have appeared. They require a very extenfive acquaintance with the languages, and all the terms thereof, and a great facility and command of writing, and of relating with perfpicuity, and in a few words.

To write a gazette, a man fhould be able to fpeak of war both by land and fea; be thoroughly acquainted with every thing relating to geography, the hiftory of the time, and that of the noble families; with the feveral interefts of princes, the

the ſecrets of courts, and the manners and cuſtoms of all nations.

Vignuel de Marville recommends a ſet of gazettes, well written, as the fitteſt books for the inſtruction of young perſons coming into the world.

The firſt gazette publiſhed in theſe parts, is ſaid to have been that of Paris, begun in the year 1631, by Theophraſt. Renaudot, a phyſician of Montpelier, in his office of intelligence.

The firſt gazette in England was publiſhed at Oxford, the court being there, in a folio half ſheet, Nov. 7, 1665. On the removal of the court to London, the title was changed to the "London Gazette." The Oxford gazette was publiſhed on Tueſdays, and the London on Saturdays; which have continued to be the days of publication ever ſince.

GAZETTE, *Extraordinary*. See EXTRAORDINARY.

GAZNA, in *Geography*. See GHIZNI.

GAZNIN, a town of Hindooſtan, in Candahar; 106 miles E. of Candahar.

GAZOLDO, a town of Italy, in the department of the Mincio; 13 miles W.N.W. of Mantua.

GAZOMETER, GASOMETER, or *Gas-holder*, are names given to certain inſtruments or veſſels formed as reſervoirs for large quantities of gas, to which are added ſuitable conveniences for receiving and applying the ſame, and for meaſuring the volume. Lavoiſier and Meuſnier were the firſt to deſign and execute ſuch an inſtrument, of which a plate, accompanied with a deſcription, was given in the Elements of Chemiſtry, publiſhed by the former celebrated philoſopher in 1789. This inſtrument was too complicated and expenſive to be of general uſe. Since that time various have been the alterations and improvements made by ſucceeding chemiſts according to the objects they had in view.

Lavoiſier's gazometer conſiſted of a cylindrical copper veſſel, open at bottom, and inſerted into another larger veſſel of the ſame kind, open at top. The internal veſſel is 18 inches in diameter, and 20 inches deep. Around the bottom of this, on its outſide, is fixed a border divided into compartments, intended to receive leaden weights, 1, 2, 3, 4, &c. in order to increaſe the weight of the veſſel when conſiderable preſſure is requiſite. The top of this veſſel is furniſhed with a tube and ſtop-cock, forming a communication between the external and internal air, alſo with a thermometer cemented into it to ſhew the temperature of the air within. The veſſel is ſupported by a chain from one of the circular ends of a balance beam; and to the other end a ſcale and weight are ſuſpended as a counterpoiſe. The external veſſel is partly filled with water, and has tubes along the bottom and riſing up to communicate with the air in the interior veſſel, for the purpoſe of admitting or diſcharging it. Some auxiliary glaſs tubes and a ſcale of inches are attached to the veſſel, to ſhew the height of the water in the inner and outer veſſel, and the difference of the heights, in order to correct for the preſſure. This partial deſcription will give an idea of the outline of the ſtructure, which is much too complicated to be exhibited as a model for the preſent time.

In the 12th vol. of the Annales de Chimie, 1792, is given the deſcription of a gazometer by Van Marum: the immediate object of it was to exhibit the compoſition of water by the ſlow combuſtion of hydrogen in a large glaſs receiver. Two of theſe gazometers were employed; the one to introduce a ſtream of hydrogen gas, and the other oxygen. The hydrogen was lighted at the commencement of the experiment by electricity. The apparatus diſplays ingenuity; but it is complicated and expenſive. In the 14th vol. of the ſame work he gives a ſimplification of the gazometer as applied to the ſame purpoſe; but it is ſtill too complex and too partial in application for general uſe.

In 1794, Mr. Watt of Birmingham publiſhed a pamphlet containing a deſcription of an apparatus for elaſtic fluids. In this he deſcribes two veſſels, the one under the name of *hydraulic bellows*, which is, in fact, the modern gazometer, and the other under the name of *air-holder*. Theſe were illuſtrated with plates. The hydraulic bellows or gazometer conſiſts of two veſſels H and J, *Plate* XIV. *(Chemiſtry) fig.* 1. The outer veſſel, H, conſiſts of two cylinders placed one within the other, and about half an inch aſunder. Theſe cylinders are joined together at bottom by a circular rim, well ſoldered to them both; and the inner cylinder is ſhut at top by a cover alſo ſoldered on. This inner cylinder is about two inches ſhorter than the outer cylinder, and the latter is ſurmounted by a cup, W W, about 1½ inch deep, and one inch all around more in diameter than the cylinder to which it is attached. The pipe, P Q, paſſes diametrically acroſs the veſſel H; the end, Q, is open, and made ſo as to be ſtopt with a cork or cock. From this pipe, P Q, proceeds a pipe V, which paſſes upwards through the cover of the inner cylinder to which it is ſoldered, and is open at its upper end. The ſecond veſſel, J, of the bellows, is a hollow cylinder of one foot diameter, and eighteen inches long, ſhut at top, and open at bottom; it is made ſo as to move up and down eaſily in the circular interſtice between the inner and outer cylinders of the veſſel H; and when that interſtice is filled with water, as high as the cover of the inner cylinder, if the veſſel J is moved up and down, it will act the part of a bellows, drawing in and blowing out air, by the pipes V and P Q. The bellows are made of tinned iron plates japanned, or of tinned copper-plates not japanned.

The air-holder is thus deſcribed: Let a cylindrical veſſel *(fig.* 2.) be made of ſtrong tin plate; this veſſel is to be cloſe at both ends, which are made concave outwards; cloſe to both the bottom and cover, ſhort pipes, U and V, proceed from the ſide of the veſſel; their diameters ſhould be the ſame as the pipe, P Q, of the bellows. Another pipe, T, paſſes through the middle of the cover or upper end of the veſſel, to which it is well ſoldered; and reaches within half an inch of the bottom. To guard this veſſel from ruſt it ſhould be japanned both inſide and out; and for the greater convenience of japanning it within, it may be made to come aſunder at the middle of its height, and when varniſhed may be cemented together by a mixture of wax and roſin uſed hot. When this veſſel is completed, the upper pipe, U, is to have a ſhort pipe, W, inſerted into it, which ſhould alſo fit the pipe, Q, of the bellows. The lower pipe, V, is then to be corked, and the veſſel filled with water by the central pipe T. This veſſel is to be placed in an empty tub, the pipe, W, inſerted into the pipe, Q, of the bellows, and cemented to it. When the bellows are filled with artificial air, the cork of the lower pipe, V, is to be taken out, and the counterpoiſe of the bellows is to be lifted up; the water in the air-holder will then run out into the tub, and the air deſcend from the bellows into the former veſſel, which, when full, muſt have its pipes cloſe corked. To transfer the air from this veſſel into a bag or bladder, fix the faucet or mouth-piece of the bag or bladder into the upper pipe U, and if you want a quart or gallon, or other meaſure of air, pour ſo much water into the air-holder through the central pipe, and exactly that quantity of air will iſſue out; then re-cork your veſſel until you want more air from it.

In the 5th vol. of the Philoſophical Magazine 1799, Mr. Pepys deſcribes a new mercurial gazometer. The principle of it is nearly the ſame as the hydraulic bellows of Mr. Watt. A *(fig.* 3.) is a repreſentation of the bell of the gazometer,

zometer, made of glaſs, furniſhed with a cock at top, and able to contain 34 ounces Troy of diſtilled water. The diviſions of capacity, determined by actual meaſurement, are marked on the glaſs with a diamond. B B, are the ſections of two cylinders of lignum vitæ (or caſt iron), the outward one ſcrewed upon the ſolid internal one, which is made to project at its lower extremity, and furniſhed with a male ſcrew, to work into a female ſcrew, with which the lower end of the external cylinder is furniſhed. The ſpace between theſe is ſo adjuſted as to be almoſt filled up by the ſubſtance of the glaſs bell, A, when dropped into it, ſo that the quantity of mercury neceſſary to fill up that ſpace is proportionally ſmall. The internal cylinder has a conducting tube up through its axis, the lower end of which is furniſhed with a female ſcrew anſwering to the male ſcrew of the cock of the ſmall receiver C. The receiver, C, is of glaſs, and open at the bottom. When this receiver is uſed, it is ſcrewed into its place, and reſts upon a ſmall cup or ciſtern of mercury, D, in which the beak of a retort, furniſhed with a bent glaſs tube, may be introduced into the receiver. E E E E ſection of a wooden ſtand upon which the cylinders of lignum vitæ or caſt iron are ſupported, having an opening through the top to permit the cock of the receiver, C, to be joined to the conducting tube of the internal cylinder B. The ciſtern, D, is adjuſted to its height by means of a riſing cylinder in the pedeſtal F. G is a transfer glaſs for mixing alkaline gaſes in vacuo, or other purpoſes, and when uſed, is joined to the top of the bell A. H, a glaſs globe and ſtop-cock, capable of holding 14 ounces Troy of water, for weighing gaſes; it receives its gas by being inverted and ſcrewed into the bell A. I, a bladder furniſhed with a ſtop-cock, to aſſiſt in holding, transferring, or mixing different gaſes. K, an elaſtic gum bottle capable of containing 30 ounces of water, for holding the acid gaſes; when uſed it is ſcrewed into the top of the transfer G; the bottom cock of the latter being at the ſame time joined to the bell A, previouſly charged with the alkaline gas; the cocks being turned, the gaſes ruſh together in vacuo. L, a ſmall portable air-pump for exhauſting the globe H. M, a double male ſcrew, which fits any part of the apparatus, and on which a valve may be faſtened. N, a double female ſcrew. O, a ſmall inſtrument, of ſervice in collecting ſpilled mercury, or transferring ſmall quantities of it.

Mr. Davy's Reſearches, &c. publiſhed in 1800, contain an account of a mercurial gazometer by Mr. Clayfield. The peculiarity of this conſiſts, in having the counterpoiſe to the cylinder ſuſpended by a ſtring which runs in a ſpiral groove ſo as to balance the cylinder, whatever its depreſſion in the mercury may be.

The 53d vol. of the Journal de Phyſique, 1801, contains a deſcription of a new gazometer by Victor Michelotti, M. D. of Turin. This inſtrument, however, can ſcarcely be recommended for its ſuperiority.

In the 13th vol. of the Philoſophical Magazine, 1802, Mr. Pepys has deſcribed a new gas-holder. The apparatus is in ſome reſpects ſimilar to that recommended by Mr. Watt. A ſmall circular ciſtern is added at top, which is connected with the gas-holder by means of two pipes furniſhed with cocks. It has alſo a braſs cock on the ſide, and a glaſs gage or regiſter tube, ſhewing the quantity of included gas by the level of the water. The following is a deſcription of the different parts, *fig.* 4. The gas-holder, G, may contain from two to ten gallons. R, the regiſter tube, the ends of which are cemented into two tin ſockets by corks at the top and bottom of the gas-holder, into which it opens at both ends; of courſe the level of the water in the apparatus will always be ſeen in the tube, and conſequently that of the gas. C, the circular ciſtern with its two cocks and pipes, marked 1 and 2. C *k* a braſs cock on the ſide, with a ſcrew, to which bladders or a blow-pipe may be attached. O, an opening into the gas-holder, in which a pipe is ſoldered at ſuch an angle, that when all the uppermoſt cocks are ſhut, no water can poſſibly eſcape. But when a conducting pipe from a retort or other apparatus generating gas, is introduced into this opening, then, as the gas paſſes up into the gas-holder, an equal quantity of water will be diſcharged at O into any veſſel fit to receive it. S *p*, a ſpout on the ſide of the ciſtern to enable the operator to add water, even when the receiver fills its whole area. H, H, handles to lift the gas-holder. R *c*, a glaſs deflagrating receiver, ſtanding in the ciſtern. A, its adopting cork and cock. S, a watch ſpring in a ſlit wire prepared for combuſtion. The wire paſſes through a cork. D, a deflagrating diſk of iron for ſulphur, phoſphorus, charcoal, ſugar, camphor, &c. B, a blow-pipe with a gum elaſtic tube, E, capable of joining the cock C *k*.

To make uſe of this apparatus; firſt fill the gas-holder with water, by cloſing the opening, O, with a cork, and alſo the cock, C *k*, and keeping the circular ciſtern full of water, while the cocks 1 and 2 are both open. The air is driven out of the gas-holder through the cock 1, by the water deſcending into it by the cock 2. When full, the water in the regiſter will be on a level with the top of the gas-holder. Then ſhut the cocks 1 and 2. You may now remove the cork from the opening, O, which is then prepared to receive the conducting pipe from any apparatus from which the gas is generating. As the gas is delivered the water eſcapes, and ſhould be caught in any convenient veſſel. The regiſter will then ſhew the quantity received; when full, cloſe the opening, O, with a cork wrapped in leather, which prevents the communication with the atmoſphere. It may now be eaſily removed or conveyed where it is wanted. When it is required to fill a glaſs receiver, as R *c*, with the gas, having previouſly filled the circular ciſtern with water, place it in the ciſtern, put in the adopting cork, A, and with the mouth applied to the cock, exhauſt the receiver in which the water will riſe till full. Then cloſe the cock, A, and open the two cocks, 1 and 2, and the gas will aſcend into the receiver, while the water will take its place in the gas-holder.

In the ſame volume of the Magazine Dr. Warwick ſuggeſts a more ſimple alteration of Mr. Watt's air-holder than the above. It conſiſts in having a rim at the top of Watt's air-holder, ſo as to admit of a column of water of an inch in depth above the ſtop cock, ſoldered to the ſhorter tube in the top of the air-holder.

In the 23d vol. of Nicholſon's Philoſophical Journal, 1809, Mr. Clegg has given a deſcription of a gazometer or gas-holder for receiving the gas from coals, for the purpoſe of lighting manufactories, &c. This is on a large ſcale, ſo as to hold ſeveral hundred cubical feet. The veſſel containing the air is made of wrought iron plates, and may be cylindrical, or, which is better, ſquare or oblong, with an internal frame of wood to preſerve the figure. This veſſel is balanced by a weight in the manner of other gazometers, and is let down into a large well or reſervoir of water, like the upper cylinder of Mr. Watt's hydraulic bellows. When in operation, a ſmall head of water preſſes on the gas, and forces it through the tubes to the lamps, where it is burned. As this apparatus is daily receiving improvement, we ſhall defer giving a full deſcription of it till the article Gas-*Light*. See alſo Light.

Rules for reducing meaſures of gaſes to weights.—In order to reduce any given meaſure of a gas to weight, the exact

weight of a given volume at a certain preſſure and temperature muſt be previouſly known. This may be ſeen in a table under the article Gas. The mean preſſure of the atmoſphere may be taken at 30 inches of mercury, and the mean temperature at 55° of Fahrenheit. The reduction, on account of preſſure, ariſes from the principle that "the volume of any gas is inverſely as the preſſure." The reduction, on account of temperature, muſt be $\frac{1}{435}$th for every degree of Fahrenheit, between the limits of 32° and 80°. At leaſt this is a ſufficient approximation: that is, the volume muſt be *increaſed* if the temperature is below 55°, and *diminiſhed* if above 55°, by the fractional part above ſpecified.

Example 1.—Required the weight of 1000 cubic inches of common air in a mercurial gazometer; the mercury within being $2\frac{1}{2}$ inches above the level of that without, the barometer at the ſame time being 29.5 inches, and the thermometer 62°

Solution.—Here the real preſſure of the gas is 29.5 — 2.5 inches = 27. Hence, 30 : 1000 :: 27 : 900 = the volume of gas reduced to 30 inches of preſſure. Again, 62° — 55° = 7°, and $\frac{7}{435}$ of 900 = 14.5, which being taken from 900, leaves 885.5 cubic inches of gas at the common preſſure and temperature. But 100 cubic inches weigh 31 grains; whence 885.5 × 31 = $274\frac{1}{2}$ grains, as required.

Example 2—Required the weight of 1000 cubic inches of common air in a water gazometer; the water within being 3 inches below that without, the barometer at the ſame time being 29.8, and the thermometer 38°.

Solution.—Here the real preſſure of the gas is 29.8 + the preſſure of 3 inches of water; but 3 inches of water = $\frac{3}{13.6}$ inches of mercury = .22 inch. Whence the preſſure = 30.02. And 30 : 1000 :: 30.02 : 1000.7, the volume of gas reduced to 30 inches of preſſure. Again, 55° — 38° = 17°, and $\frac{17}{435}$ of 1000.7 = 39.1, which being added to 1000.7, gives 1039.8 cubic inches of gas at the common preſſure and temperature = $322\frac{1}{3}$ grains.

GAZONS, in *Fortification*, turfs, or pieces of freſh earth covered with graſs, cut in form of a wedge, about a foot long, and half a foot thick, to line or face the outſides of works made of earth, in order to keep up the ſame and prevent their mouldering.

GAZOPHYLACIUM, in the *Jewiſh Antiquities*, according to the Greek etymology, of γαζα, *treaſure*, and φυλαττω, *I keep*, ſignifies the treaſury-chamber. There were ſeveral places in the temple of Jeruſalem, where the rich preſents conſecrated to God by kings, princes, or private perſons, were kept. But the ſignification of this word, gazophylacium, has been farther enlarged, ſo as to comprehend the rooms where the proviſions of the temple were laid up, both for ſacrifices, and for the ſupport and ſuſtenance of the prieſts, and in general this word is uſed for all the apartments of the temple. In the Goſpel, by gazophylacium is meant the cheſt into which people caſt their offerings at the entrance of the temple. It has been alſo uſed by naturaliſts for a collection of figures of curious ſubjects. Mark xii. 41, 43. Luke xxi. 1.

GAZOPHYLAX, Γαζοφυλαξ, in *Antiquity*, an officer who had the care and management of the treaſure belonging to the kings of Perſia.

GAZUA, in *Geography*, a mountain of Arabia; 60 miles E. of Mecca.

GAZUATI, a name given by the natives to a chain of mountains in the viceroyalty of La Plata, which is conſidered as terminating the wide plains or ſteppes called Pampas on the ſouth. It is called by the Spaniards La Vantana, and the eaſtern part is denominated the Volcan, from its form, as there is no indication of a volcano. It is ſuppoſed not to exceed 1000 feet in height.

GAZYPOUR, a circar, or province, of Hindooſtan, bounded on the north-eaſt by the Dewah, on the ſouth by the Ganges, and on the weſt by Benares and Jionpour; of a triangular form, and about 180 miles in circumference. —Alſo, a town, the capital of the forementioned circar, on the left bank of the Ganges; 92 miles E. of Allahabad. N. lat. 25° 36′. E. long. 84° 48′.

GAZZA, in *Ornithology*, the name of a ſpecies of *heron* (Ardea *alba*), common in Italy, and called by many authors *ardea alba major*, the *greater white heron*. Its whole body is of a ſnow white, its beak yellow, its head ſmooth, its legs black, and the membranes about its eyes green; though called large in compariſon of the leſſer white one, it is ſmaller than the common grey heron. Its tail alſo is much longer, and has no creſt. It is ſometimes ſeen in England, and has been miſtaken for a common heron become accidentally white, as ſparrows and other birds ſometimes are. See Heron.

GAZZANIGA, Giuseppe, of Verona, in *Biography*, a diſciple of Sacchini, and an agreeable compoſer in the elegant and graceful ſtyle of his maſter. He has compoſed more comic than ſerious operas, and began to be noticed as a muſician of taſte and genius in 1771, when his burletta, intitled "La Locanda," excited the attention and hopes of the public, which have not been diſappointed. He was living in 1796, and compoſed operas, chiefly comic, for ſeveral cities of Italy.

GAZZETTA, in *Ornithology*, a name given by Geſner and others to a ſpecies of ſmall white heron, ſold in the markets of Italy, and ſeeming to be the *ardea alba minor* of authors, or *gaza giovane* of the Venetians. See Garzetta and Heron.

GAZZETTO, in *Ichthyology*, the name of a fiſh of the turdus or wraſſe kind, (a ſpecies of *Labrus*, which ſee,) caught in the Mediterranean, and ſold in the markets of Italy. It is of a fine green colour, and is conſiderably thick, though broad; its fins are ſpotted, and it has a large purple tubercle near the anus. It has only one back-fin which has twenty-four ribs or nerves, the firſt fifteen of which are rigid and prickly, the reſt ſmooth and flexile.

GEA, in *Ancient Geography*, a town of Arabia, near Petra. Steph. Byz.

GEANNIDES, in *Natural Hiſtory*, a name given by ſome authors to the ſtone called by others encymonites. It ſeems to have been the ſame with our ſparry incruſtations on the tops of caverns, &c. but the word has been generally underſtood to mean the eagle-ſtone.

GEAR, or *about your gear*, at *Sea*, a command to work on all hands.

GEARON, or Jaroon, in *Geography*, a town of Perſia, in the province of Farſiſtan, celebrated for its excellent fruits, raiſins, pomegranates, dates, and quinces; 70 miles S.E. of Schiras.

GEASTRUM, in *Botany*, from γεα, *the earth*, and αστηρ, *a ſtar*. Perſoon Syn. Fung. 131. (Geaſter; Mich. Gen. 220. t. 100.)—Claſs and order, *Cryptogamia Fungi*. Nat. Ord. *Fungi*; ſect. *Dermatocarpi*, Perſ.

Micheli founded this very natural genus on the Puff-balls with a ſtellated volva, *Lycoperdon ſtellatum* of Linnæus, and its allies. Perſoon, in adopting it, very properly altered the termination of the name, that it might not be a mere compound of another eſtabliſhed generic name, *Aſter*. He gives the following generic character.

Volva thin, evaneſcent. Outer coat of the *peridium* cloven

 ſtar-

ftar-wife, at length reflexed: orifice of the head ufually hairy.

We fhould rather call this "outer coat" an inner volva, after Linnæus; the true *peridium*, or receptacle of the feeds, being the membranous round head, whofe orifice is ufually hairy.—The fpecies are fix; among them are

G. *coliforme*, (Lycoperdon coliforme; Sowerby's Fung. t. 313. Dickf. Crypt. fafc. 1. t. 3.), found only in fome few places in Norfolk and Suffolk, remarkable for having numerous orifices in its head, and as many ftalks to fupport it.

G. *coronatum*, (Lycoperdon ftellatum; Sowerb. Fung. t. 312. L. volvam explanaus; Schmid. Ic. t. 46.), is much more common, and appears to be what Linnæus intended by his *ftellatum*.

G. *quadrifidum*, (Lycoperdon fornicatum; Hudf. 644. Sowerb. Fung. t. 198.), has a fingularly vaulted and elevated volva. It is found in Kent, Norfolk, and Yorkfhire.

G. *rufefcens*, figured in Schmidel, t. 43, and in Schæffer's Fungi, t. 182, has a feffile head. This is found in Germany and England. We believe Bolton's t. 179, belongs rather to the *coronatum*. See PERSOON.

GEAUNE, in *Geography*, a town of France, in the department of the Landes, and chief place of a canton in the diftrict of St. Sever; 12 miles S.E. of St. Sever. The place contains 788, and the canton 7479 inhabitants, on a territory of 167½ kiliometres, in 19 communes.

GEBA, a town and country of Africa, on a river of the fame name, which joins the river St. Domingo. N. lat. 11 55'. W. long 14'. The river *Geba*, or *Gefves*, which is one of thofe that forms the delta of the Biffagos, has a very fteep defcent, and is fubject to a tremendous *bore*, or influx of the tide, which afcends in three hours or lefs, while the decline is of fix hours. This phenomenon is known in feveral other rivers, as the Ganges, Maranon, Severn, and at Libourne near Bourdeaux. See BORE.

GEBAL, in *Ancient Geography*, a town of Phœnicia, the fame with Byblos and Gabala. Ptol.

GEBALA, a town of Hifpania Tarragonenfis, in the country of the Varduli. Ptol.

GEBALITÆ, a people of Arabia Felix, diftinguifhed by Pliny from the *Catabani*, though probably connected with, or fubordinate to, one another; for Tanna, or Thomna, the capital of the one, was alfo the capital of the other. Strabo places them near the entrance of the Arabic gulf: but Ptolemy fixes their fituation at the mouth of the Perfic gulf.

GEBAU, in *Geography*, a town of Bohemia, in the circle of Boleflaw; fix miles S. of Benatek.

GEBAU, *New*, a town and caftle of Silefia, in the principality of Oppeln; 10 miles S.E. of Falkenburg.

GEBBAR, a town of Afiatic Turkey, in the province of Diarbekir; 10 miles S.E. of Jadida.

GEBBATHON, or GIBBETHON, in *Ancient Geography*, probably the fame with *Gabbatha*, a Levitical city in the tribe of Dan, on the frontiers of Judah; 12 miles from Eleutheropolis, where was fhewn the tomb of the prophet Habbakuk.

GEBEL, or GEBAL, fignifying a mountain, gives denomination, with appropriate additions, to feveral mountains in Arabia, Egypt, and Abyffinia: fuch as, G. *Camar*, a mountain of Arabia, extending N.E. from Fartach:—G. *Docan*, a mountain of Egypt, 100 miles S. of Suez:—G. *Ezzeit*, a mountain of Egypt, near the coaft of the Red fea; 110 miles S.S E. of Suez:—G. *Geranat*, a mountain of Arabia, on the right bank of the Nile; 28 miles N. of Enfeneh:—G. *Farah*, a mountain of Arabia; 15 miles S.W. of Ailah:—G. *Ibn Jakub*, a mountain of Arabia; 65 miles S.S.E. of Hali:—G. *Naklon*, a mountain of Egypt; 8 miles S.W. of Fayoum:—G. *Ollak*, a mountain of Abyffinia, rich in gold; N. lat. 20° 50':—G. *El Silfili*, or the Chained mountain, a mountain of Egypt, on the E. fide of the Nile, fo called, becaufe in ancient times a chain was thrown acrofs the river; 42 miles N. of Syené:—G. *Sinan*, a mountain of the Arabian Irak; 25 miles N.W. of Baffora:—G. *Tar*, a volcanic ifland in the Red fea, anciently called *Combufta*. N. lat. 15° 18'. E. long. 59° 19':—G. *Teileman*, a mountain of Egypt, on the W. fide of the Nile; 12 miles N.N.W. of Syené:—G. *Teir*, or mountain of birds, a mountain of Egypt, on the E. bank of the Nile, named from a fabulous tradition that all the birds of the univerfe hold a council here annually; 24 miles N. of Enfeneh:—G. *Zaghir*, an ifland in the Red fea. N. lat. 14°. E. long. 60° 28'.

GEBEL-*Aroc*, a clufter of fmall iflands in the Red fea. N. lat. 13° 36'.

GEBER, in *Biography*, commonly called the *Arabian*, was a Greek by nation, according to Leo Africanus, who adds that he abandoned Chriftianity and became a Mahometan. Other writers affert that Geber was born at Seville, in Spain, but that he was of Arabian origin; it is even affirmed that he was grandfon of Mahomet by his mother's fide. There is equal difference of opinion as to the age in which he lived: according to Blancanus, he flourifhed in the ninth century; according to others in the eighth, and even in the feventh. This laft period is moft generally fuppofed to be the true one.

That Geber was a man of extenfive attainments, the catalogue of his writings, given in the Bibliotheca of Gefner, fufficiently evinces. He was learned in chemiftry, and is confidered as having been one of the firft reformers in that art. Paracelfus, who feldom beftowed praife, called him the mafter of mafters in the art; and Boerhaave fpeaks of him, in his Inftitutes of Chemiftry, with great refpect. His works, indeed, contain much curious matter relative to the nature, purification, fufion and malleability of the metals, with excellent hiftories of the falts and acids: and the accuracy of many of his operations is furprifing. He was addicted, however, to all the reveries and vain purfuits of the alchemifts, and condefcended occafionally to ufe the myftical jargon of the tribe. Dr. Johnfon is difpofed to derive the word *gibberifh*, which he fays was anciently written *gebrifh*, and probably fignified the jargon of the alchemifts, from Geber. The works of this author were publifhed in Englifh at Leyden by Richard Ruffell, in 1668.—Eloy. Dict. Hift.

GEBESEE, in *Geography*, a town of Germany, in Thuringia; 8 miles N.N.W. of Erfurt. N. lat. 51° 10'. E. long. 10° 59'.

GEBIZEH, a town of Afiatic Turkey, in Natolia, fuppofed to be the ancient Libyffa, where Hannibal killed himfelf; 18 miles W. of Ifmid.

GEBRES. See GAURS and GENTOOS.

GEBROOKEN, one of the fmaller Japanefe iflands, near the S. coaft of Niphon. N. lat. 34° 36'. E. long. 139°.

GEBUL, a town of Syria; 20 miles S.E. of Aleppo.

GEBY, an ifland in the Eaft Indian fea, between Waygoo and Gilolo, about 15 miles long and 3 broad, on the equinoctial line. E. long. 129° 25'.

GECCO, or GEKKO, in *Natural Hiftory*, a name given by the Indians to their terrible poifon, which kills in ever fo fmall quantity when mixed with the blood. They fay that this gecco is a venomous froth or humour, vomited out of the mouths of their moft poifonous ferpents, which they

procure

procure in this fatal ſtrength, by hanging up the creatures by the tails, and whipping them to enrage them: they collect this in proper veſſels as it falls, and when they would uſe it, they either poiſon a weapon with it, or wounding any part of the fleſh, introduce the ſmalleſt quantity imaginable of it, and this is ſaid to be immediate death.

GECKO, in *Zoology*, a ſpecies of *Lacerta*, which diſcharges the poiſonous juice above-mentioned. See LACERTA *Gecko*.

GED, or GID, in *Ornithology*, an Engliſh name for the ſmall ſpecies of ſnipe, uſually called the *Jackſnipe*, or *Judcock*, and by authors *gallinago minima*. See SCOLOPAX *Gallinula*.

GEDAN, in *Geography*, a ſmall iſland in the Red ſea. N. lat. 16° 20′.

GEDAN, or *Ziden*, a town of Arabia; 30 miles S.S.E. of Jidda.

GEDDES, ALEXANDER, in *Biography*, was born at Arradowl, in the county of Banff, and in the pariſh of Ruthven, September 4, 1737, old ſtyle. His father's name was Alexander Geddes, the ſecond of four brothers. His mother's maiden name was Janet Mitchel; ſhe was born in Nether Dalachy, in the pariſh of Bellay. They were reſpectable, but not opulent farmers, ſuch as farmers are in that part of the country, ſubject to grievous oppreſſions from their landlords. In that ſtation, however, they maintained an excellent reputation, and laboured inceſſantly to give an education to their children, far above their rank. In their religious ſentiments they were liberal Roman Catholics, in whoſe library, we are told, the principal book was an Engliſh edition of the bible, which they taught their ſon to read with reverence and attention at a very early period. In his infancy, the principal facts contained in that book were familiar to his mind, and, before he had attained his eleventh year, he knew all its hiſtory by heart. He was afterwards ſent to Scalan, an obſcure place of education in the Highlands, at which thoſe young perſons were brought up, who had been devoted to the prieſthood, and who were deſtined to finiſh their ſtudies at a foreign univerſity. At this ſeminary, we have reaſon to believe, young Geddes laid the foundation of that ſuperior ſkill in the learned languages, for which he was afterwards ſo eminently diſtinguiſhed. In October 1758, he was ſent from Scalan, to the Scotch college in Paris, where he arrived about the end of December, after having narrowly eſcaped ſhipwreck in his paſſage from Aberdeen to Camphire. Mr. Gordon was then principal of the college. In a few days after his arrival, he began to attend the lectures, and entered immediately into rhetoric. He ſoon got at the head of the claſs; although there were two veterans in it. Vicaire was then profeſſor, and contracted a friendſhip for him, which laſted all his life. At the beginning of the next ſchool-year, he ſhould have entered into a courſe of philoſophy; but was perſuaded to ſtudy philoſophy at home at intervals, and to enter in divinity. He attended the lectures of M. M. Buré and De Saurent at the college of Navarre, and of Ladvocat, for the Hebrew, at the Sorbonne. Ladvocat was particularly attentive to him, and wiſhed much to have him remain at Paris; but other counſels prevailed; and he returned to Scotland in the year 1764. On his arrival at Edinburgh he was ſent to Dundee, to officiate as prieſt to the Catholics in the county of Angus. But he did not remain long in that ſtation; being removed in May 1765, to Traquaire, where he reſided nearly three years as domeſtic chaplain to the earl of Traquaire. Of this connection he was accuſtomed to ſpeak with ſatisfaction and gratitude, as having afforded him much leiſure for literary purſuits, and the uſe of a well-furniſhed library, admirably adapted to aſſiſt him in his favourite ſtudies. He left Traquaire in the autumn of 1768; and after a few weeks ſtay in Angus, returned to Paris, where he remained the following winter; during which he was moſtly in the king's and other libraries, and made ſeveral extracts from rare books, particularly Hebrew ones. In the ſpring of 1769, he returned to Britain, and undertook the charge of a conſiderable Roman Catholic congregation at Auchinhalrig, in Banffſhire. In the ſummer of 1770, he projected and built a new chapel on the ſame ſpot where the old one ſtood; and ſoon after made the old houſe at Auchinhalrig one of the moſt neat and convenient belonging to the Roman Catholic clergy in Scotland. This, and other unavoidable expences, encumbered him with debt; from which he was however relieved by the generoſity of the late duke of Norfolk. He then thought, that a little farm would help him to live more comfortably; but the conſequence was quite the reverſe; he was obliged to borrow money to ſtock it, and the failure of three ſucceſſive crops plunged him deeper in debt. In 1779, he left Auchinhalrig; after having continued during ten years in the aſſiduous diſcharge of the various duties belonging to his paſtoral office; and when he retired, it was with the moſt ſincere and unfeigned regret of all thoſe among whom he had miniſtered. The attention which he paid to the inſtruction of the young had never been ſurpaſſed, and but rarely equalled, by any of his predeceſſors.

His great learning, which began now to be univerſally known among the literati of the north, obtained for him, in the year 1780, a diploma, creating him doctor of laws, from the univerſity of Aberdeen. This was an honour that had never ſince the reformation been conferred by that body on a Roman Catholic. About this period Dr. Geddes came to London, and officiated for a few months as prieſt in the Imperial Ambaſſador's chapel, till it was ſuppreſſed at the end of the year 1780, by an order from the emperor Joſeph II. Dr. Geddes afterwards preached occaſionally at the chapel in Duke-ſtreet, Lincoln's-inn-Fields, till Eaſter 1782, when it is believed he totally declined the exerciſe of all clerical functions. It was at a much earlier period than this, that he formed a deſign of giving a new tranſlation of the whole bible. About the year 1760, he began to read with this view: he was then acquainted with only two verſions of that book, the vulgar Latin, and the vulgar Engliſh; in favour of the latter he had been much prepoſſeſſed in the early part of his life; but when he had acquired a knowledge of the Latin language, ſufficient to enable him to compare the two tranſlations, he gave a decided preference to the Vulgate. The Engliſh appeared to him rugged, conſtrained, and often obſcure, where the Latin was ſmooth, eaſy, and intelligible.

In the year 1762, he began to read the originals, with theſe verſions conſtantly before him, when he quickly diſcovered that the great object of the Engliſh tranſlators had been to give a ſtrictly literal verſion, at the expence of almoſt every other conſideration; while the author of the Vulgate had endeavoured to render the original equivalently, into ſuch language as was current in his age. Struck with the advantages of the latter method, Dr. Geddes immediately reſolved to follow the ſame plan if he ſhould ever tranſlate the bible. His original ideas, in this reſpect, though frequently reviewed by him, underwent but few alterations. The unwearied attention which he paid to the ancient verſions in the Polyglott confirmed him in the opinion, that a ſtrictly literal verſion was not the moſt proper to convey its meaning, and diſplay its beauties, ſince even thoſe tranſlators, who had the text to render, not into a different language, but only into different dialects of the ſame language, had not

attempted

attempted a ſtrictly literal verſion, and that thoſe of them who were the leaſt literal, had the moſt forcibly and intelligibly rendered their text. That Dr. Geddes ſhould have had, among the members of his own church, an hoſt of oppoſers, will not afford matter of aſtoniſhment to any one: he ſeems to have anticipated obloquy from the rich and the low vulgar, as the principal reward of an almoſt more than Herculean labour. But he was contented to go through evil as well as good report. He knew he had not a "mercenary ſoul;" the public knows, and poſterity will confeſs, that he poſſeſſed one expanded with the beſt principles of liberality and diſintereſtedneſs. "I expect not," ſays he, "exceſſive profits from exceſſive exertions. I truſt I ſhall never want meat, and clothes, and fire; to a philoſophic and contented mind, what more is neceſſary?"

It appears that Dr. Geddes had been engaged ſeveral years in this great undertaking before he ſaw any proſpect of meeting with encouragement ſufficient to make it public, if it were completed, and ready for the preſs. He had, in addition to difficulties common to ſituations of this kind, to contend with others peculiar to himſelf. He had a mind ardently intenſe in the purſuit and inveſtigation of truth. He could not brook error in any perſon, however exalted, nor would he hear it advanced and maintained, without ſhewing the indignation of a high and noble ſpirit. The ſentiment contained in the preface to his letter, addreſſed to the Engliſh Catholics, was one of the leading maxims by which his life was governed. "At any rate, I do what I think it my duty to do, and do it fairly and openly. In the following pages, ye will find neither palliation nor diſguiſe. I pour out my ſentiments with the ſame ſincerity as if I were before the tribunal of Him who is to judge the living and the dead. Miſtake I may, but prevaricate I never will." Such a ſpirit ſhewn in almoſt every act of his life, and in all the ſocial intercourſes and connections with the world, though meriting the applauſe of every honourable mind, was not the moſt likely to conciliate the regards of thoſe who might have afforded him real and effectual aſſiſtance. After he had ſpent much of his valuable life in biblical ſtudies, he complains of having met with a long and cruel interruption to them, and ſays, "I had but little hopes of ever being in a ſituation to reſume them, when Providence threw me into the arms of ſuch a patron as Origen himſelf might have been proud to boaſt of, a patron, who, for theſe ten years paſt, has, with a dignity peculiar to himſelf, afforded me every conveniency that my heart could deſire towards the carrying on and completing of my arduous work." The public are not now to be told that this liberal patron, of high and diſtinguiſhed worth, and of biblical literature, was the late excellent lord Petre.

In the year 1786, Dr. Geddes publiſhed his "Proſpectus of a new Tranſlation of the Bible," which excited very conſiderable attention; and in 1788 he publiſhed "Propoſals for Printing by Subſcription a New Tranſlation of the Bible, &c." but it was not till the ſpring of the year 1792, that the firſt volume of this work made its appearance. The volume contained the firſt ſix books of the Old Teſtament, and was dedicated to his excellent patron lord Petre. Soon after the publication, three vicars apoſtolic, who ſtyled themſelves the biſhops of Rama, Acanthos, and Centuriæ, iſſued a paſtoral letter, addreſſed to their reſpective flocks, warning them againſt the reception of Dr. Geddes's verſion. This unwarrantable ſtretch of eccleſiaſtical power occaſioned a correſpondence between Dr. Geddes and the biſhop of Centuriæ, in the courſe of which, the prelate, probably feeling his own impotence in argument, availed himſelf of the little brief authority of office, and declared the doctor ſuſpended from the exerciſe of his eccleſiaſtical functions unleſs he would ſignify his ſubmiſſion to an injunction contained in the paſtoral letter. The worthy doctor was not to be intimidated: no dread of perſonal inconvenience could arreſt him in his progreſs. His reply was conceived in highly animated terms, and admirably adapted to the circumſtances of the caſe. And in a ſtill longer letter to the biſhop of Centuriæ, he ſays, "I truſt ye will not deem it preſumption in me to grapple with biſhops; indeed, I would boldly grapple with popes, if popes dared to injure me. Our Catholic anceſtors frequently grappled with them, and ſometimes came off victorious. A pope, and conſequently a biſhop, may do wrong, and if he do wrong, may be told of it even by an inferior." In the year 1797, the ſecond volume of the Tranſlation was given to the world. In the preface to this volume, the author controverts and indeed gives up the popular doctrine of the abſolute and plenary inſpiration of the Scriptures: he conſiders the Hebrew hiſtorians to have written, like all other hiſtorians, from ſuch human documents as they could find; conſequently, like them, liable to miſtakes. The doctor alſo gave up as fabulous, and totally unworthy of the divine goodneſs, ſuch commands and injunctions, as appeared to his mind to be unworthy even of human authority; and in this view of the ſubject he denied, without heſitation, that the command given to deſtroy the Canaanites could be of divine origin.

In his volume of "Critical Remarks," publiſhed in 1800, he entered into a full vindication of this theory. If the mention of obnoxious opinions created him an hoſt of opponents, a juſtification of them was not likely to abate their fury, nor very much diminiſh their number. As he wrote to pleaſe no party, he had enemies in every party, and indeed to a perſon who thought and wrote ſo freely, this will not be unexpected. Dr. Prieſtley even, who had himſelf been a thouſand times calumniated as an unbeliever, ſeemed to doubt if ſuch a man as Geddes, who believed ſo little, and who conceded ſo much, could be a Chriſtian. To doubts of every deſcription, and to all his various opponents, the doctor replied, in a work entitled "A General Anſwer to the Queries, &c." He had before this given a tolerably explicit avowal of his creed. "The goſpel of Jeſus is my religious code: his doctrines are my deareſt delight: his yoke is eaſy, and his burthen light; but this yoke I would not put on; theſe doctrines I could not admire; that goſpel I would not make my law, if reaſon, pure reaſon, were not my prompter and preceptreſs. I willingly profeſs myſelf a ſincere, though unworthy diſciple of Chriſt: Chriſtian is my name, and Catholic my ſurname. Rather than renounce theſe glorious titles, I would ſhed my blood, but I would not ſhed a drop of it for what is neither Catholic nor Chriſtian."

Beſides the tranſlation of the early books of the Bible, the Critical Remarks, and thoſe other works to which we have already referred, we ſhould notice, as highly deſerving the attention of the biblical ſcholar, a letter to the biſhop of London, 1787. In 1793, he wrote an addreſs to the public on the publication of his new tranſlation: and in the ſucceeding year, his letter to, and correſpondence with, the biſhop of Centuriæ, were publiſhed. As a controverſialiſt, Dr. Geddes diſtinguiſhed himſelf in the year 1787, by a letter to Dr. Prieſtley, in defence of the divinity of Jeſus Chriſt; and by a letter to a member of parliament, on the expediency of a general repeal of all penal ſtatutes that regard religious opinions. In a modeſt apology for the Roman Catholics of Great Britain, publiſhed in the ſpring of 1800, Dr. Geddes has diſplayed much zeal in defence of the tenets to which he adhered; great moderation when deſcanting upon the injuries to which himſelf and brethren

were ſubject, by the continuance of perſecuting laws; and ſound reaſoning when he argues in behalf of the juſtice and policy of aboliſhing all legal diſabilities for conſcience ſake. This work deſerves the attentive peruſal of the liberal and candid of every ſect. The author has taken large and comprehenſive views of his ſubject; and has, in the diſcuſſion of it, diſplayed great ingenuity and acuteneſs—very extenſive reading—great variety and depth of learning—uncommon vigour of thought and energy of diction. He was author of many lighter pieces, poetical and proſe. In purſuing his great work Dr. Geddes intended next to have preſented the world with a new tranſlation of the book of Pſalms; but during the laſt year of his life, his literary purſuits were greatly interrupted by a long ſeries of painful affliction, yet in every interval of eaſe he applied himſelf to a work in which his heart was engaged. He had already printed one hundred and four of the Pſalms, and had prepared completely for the preſs as far as the 118th, when he was arreſted by a moſt painful and excruciating diſorder, which terminated his valuable and important life on the 26th of February 1802. The tranſlation of the book of Pſalms was publiſhed in 1807, as a poſthumous work, by his highly valued friends the Rev. Dr. Diſney, and Charles Butler, eſq.

Dr. Geddes's diſpoſition was truly philanthropic and benevolent, and his wit and vivacity contributed greatly to the delight of the ſocial parties in which he mixed. He was a ſtrenuous and uniform advocate for uncontrolled freedom of opinion, and freedom of diſcuſſion: he was, in the ſtricteſt ſenſe of the word, a genuine Catholic, extending his good will to all of every ſect and party, and diſpoſed to grant to others every privilege which he claimed for himſelf. Monthly Magazine, 1802. New Annual Regiſter. Good's Life of Geddes.

Geddes, James, a learned Scotch writer, deſcended from a reſpectable family in the county of Tweedale, was born about the year 1710. In early life, he made a rapid progreſs in the learned languages, and in the elements of philoſophy, and ſoon entered with ſpirit into the ſentiments, and felt the beauties of the ancient writers. Having gone through his elementary courſe at ſchool, he was transferred to the univerſity of Edinburgh, where he made conſiderable proficiency in mathematics and natural philoſophy, under the tuition of the celebrated Maclaurin. His attention at a proper period was directed to the law, and he was admitted an advocate. For ſeveral years he practiſed at the bar with a high and uniformly increaſing reputation, and afforded flattering hopes of riſing to eminence in his profeſſion, but he died of a decline while he was young. His private character was amiable, and his loſs was ſincerely lamented by all who knew him. He retained through life that reliſh for ancient literature which he had imbibed in his youth, and devoted what time he could ſpare from the duties of his buſineſs, and the affairs of his family, to the ſtudy of the ancient poets, philoſophers, and hiſtorians. He was author of "An Eſſay on the compoſition and manner of writing of the Ancients, particularly Plato." This was publiſhed after his death, and it was once intended to print ſome of the other papers which he left behind him.

Geddes, Michael, a learned divine who flouriſhed in the ſeventeenth and eighteenth centuries. The time and place of his birth are not known, nor is it aſcertained where he was educated. He is firſt noticed in the capacity of chaplain to the Engliſh factory in that city, the duties of which he diſcharged for nearly ten years. But during that time, *viz.* in the year 1686, he was ſummoned to appear before the court of Inquiſition. On his entrance before the judges they received him with an affectation of civility, and deſired him to be ſeated, but almoſt before he could accept of their offer they ſternly demanded how he dared to preach, or to perform any of the duties of his office in that city. Geddes, knowing upon what ground he ſtood, was not to be intimidated, he boldly replied that he enjoyed that liberty by virtue of an article in the treaty between the crowns of Portugal and England; that it was a privilege which had never been called in queſtion, and that he had reſided at Liſbon eight years, during which time he had ſerved the Engliſh factory in the capacity of chaplain, as others had done before him. To theſe declarations they replied, in defiance of all truth and modeſty, that they had been ignorant that ſuch liberty had been aſſumed by him and others, or that it ſhould not have been allowed. They then ſtrictly enjoined him to miniſter no more to his congregation. Letters of complaint were addreſſed by the factory to the biſhop of London, but before their arrival the prelate was ſuſpended, and no hopes of redreſs could be expected from the arbitrary and tyrannical James, by whom and his courtiers the Portugueſe were probably excited to this ſtep. In this ſtate of affairs, Mr. Geddes, finding himſelf no longer of uſe to the Engliſh reſidents, thought it adviſable to return to his native country, which he did in 1688. In a ſhort time after this he was created doctor of laws, and made chancellor of the dioceſe of Sarum. He died about the year 1714, leaving behind him ſeveral valuable works. Among theſe were "The hiſtory of the church of Malabar, from the time of its being diſcovered by the Portugueſe, in the year 1501, and of the Synod of Diamper, celebrated in the year 1599." "The church hiſtory of Ethiopia, including an account of the two great Roman Miſſions into that empire." "The Council of Trent, no free Aſſembly &c. &c." Alſo three volumes of "Miſcellaneous Tracts," relating to ſubjects in civil and eccleſiaſtical hiſtory; ſeveral Tracts againſt Popery, and the life of "Don Alvaro de Luna." Biſhop Burnet, who was his acquaintance and friend, ſays "he was a learned and wiſe man. He had imbibed a true notion of popery, as he had found it eſtabliſhed in Portugal, and as it was known in this country during the reigns of the Stuarts, as a political combination, managed by falſehood and cruelty to eſtabliſh a temporal empire in the perſons of the popes." Burnet's Hiſt. of Reformation.

GEDDINGTON, in *Geography*, a pariſh in the hundred of Corby, Northamptonſhire, England, has been formerly a place of note; as king Henry II. held a parliament here in 1188, to raiſe money for a cruſade. Nearly in the centre of the village is a ſtone croſs, which king Edward I. raiſed to perpetuate the memory of his queen, Eleanor. This croſs conſiſts of a triangular ſhaft, raiſed on ſteps, and is decorated with various ornaments and ſtatues in niches. A plan, view, and details of it are publiſhed in "the Architectural Antiquities of Great Britain," wherein its hiſtory is narrated, with accounts of other croſſes erected on the ſame occaſion. See vol. X. of this work, under the word Cross. This village conſiſts of 152 houſes, which are occupied by 663 inhabitants. Beauties of England and Wales, vol. xi.

GEDER, and Gederoth, in *Ancient Geography*. See Gadara.

Geder, in *Geography*, a town of Aſiatic Turkey, in the government of Sives; 15 miles S.W. of Amaſieh. See Amasieh.

GEDERN, or Geudern, a town of Germany, in the county of Konigſtein; 25 miles S.E. of Gieſſen.

GEDIDE, a town of the Arabian Irak, on the Euphrates; 16 miles S.E. of Bagdad.

GEDINGOOMA, a town of Africa, in Kaarta; 30 miles N.W. of Kemmoo.

GEDINNE, a town of France, in the department of the Sambre and Meufe, and chief place of a canton in the diftrict of St. Hubert. The place contains 270, and the canton 6340 inhabitants, on a territory of 347½ kiliometres, in 32 communes.

GEDOYN, Nicholas, in *Biography*, a French abbè, was born at Orleans in 1667. He was educated at the Jefuits' college in Paris, and afterwards entered their fociety, in which he remained ten years. He then quitted it, and appeared in the world as a man of gallantry and letters, and a wit. He was intimate with the celebrated Ninon de l'Enclos, but his way of life did not injure his fortune, for he was prefented with feveral inftances of church preferment. He was, on account of his great literary reputation, admitted a member of the Academy of Belles Lettres, and alfo of the French academy. He died in 1744, leaving behind him the character of a man of ftrict integrity, of great urbanity and candour. He was a great admirer of antiquity, and held all attempts in poetry and eloquence as vaftly inferior to the mafter-pieces of the ancients. He publifhed "Œuvres Diverfes" a collection of differtations on moral and literary topics: and he was the tranflator of Quintilian and Paufanias: his verfion of the firft is accounted one of the moft elegant performances of the kind; and his tranflation of Paufanias is alfo elegant, and is enriched with learned notes. Moreri.

GEDROSIA, in *Ancient Geography*, an extenfive province of Afia, bounded on the W. by Carmania, on the N. by Drangiana and Arachofia, on the E. by Guzerat, a province of India, and on the S. by the Indian ocean. It is now called *Makran*; which fee. Its chief river was the Arbis; and its principal cities were Pofis, Arbis, and Cuni. It was anciently inhabited by the Arbitæ, Parfiræ, Mafarnæi, and the Rhamnæ; and was divided into eight provinces or fatrapies, containing twelve confiderable towns. Marcian of Heraclea and Ptolemy place in this county a famous emporium, called γυναικων λιμνη, or the "Haven of Women."

GEDUMAH, in *Geography*, a country of Africa, on the eaft fide of the river Senegal, governed by a king, who is a Mahometan; bounded on the N. by Sahara, or the Great Defert, on the E. by Jaffnoo, on the S. by Jaaga, and on the W. by Foota-Torra; of a fquare form, about 60 miles each way. N. lat. 14° 50′ to 16°. W. long. 9° 40′ to 11° 20′.

GEDWABENEN, a town of Pruffia, in the province of Oberland; 6 miles N.W. of Paffenheim.

GEEL, John Van, in *Biography*, an hiftorical painter of the Dutch fchool:—one of thofe imitators of Metzu, whofe works ferve not to aid the credit of the mafter, but more to puzzle the connoiffeur and affift the picture-dealer in his nefarious practices of impofition upon thofe amateurs of painting whofe zeal furpaffes their knowledge. The arrangement of his pictures, and his colour and character of fubjects, are the fame with thofe of Metzu; and his works are therefore conftantly miftaken for thofe of that painter.

GEELE, or Gheele, or *Gele*, in *Geography*, a town of Brabant; 10 miles N.W. of Dieft.

GEEMSKERSKOI Nos, a cape on the eaft coaft of Nova Zembla. N. lat. 77° 10′. E. long. 77° 14′.

GEEONG, a town of the ifland of Borneo. N. lat. 5° 10′. E. long. 117° 10′.

GEER, Charles de, in *Biography*, a celebrated naturalift, defcended from an ancient noble Dutch family, eftablifhed in Sweden, in the time of Guftavus Adolphus, an individual of which, introduced into that country various improvements in the manufactures and mechanical arts, particularly in the method of cafting and working in brafs, and on that account was ennobled. The fubject of this article was born in 1720, and in his fourth year accompanied his parents to Holland, from which he returned to Sweden at the age of eighteen. At this period he had made very confiderable progrefs in his ftudies in natural hiftory under Linnæus and other celebrated profeffors; and by the death of his uncle he came into poffeffion of a confiderable fhare in the iron works of Dannemora, and it being then very difficult and expenfive to keep them free of water, he did a great and moft important fervice to thefe mines by the activity with which he promoted the improvements made in the machinery. By his other inventions he obtained confiderable property, but the riches which he acquired by his genius and induftry, he privately fhared with the poor, and built or repaired churches, and eftablifhed various fchools. His leifure time he devoted to the ftudy of the minuter parts of creation, which, by the help of glaffes, he carried to a great degree of perfection. In the year 1761 he was appointed marfhal of the court, and knight of the Polar ftar, and in 1772 he was made commander of the order of Vafa, with the grand crofs, and in a few months he was raifed to the dignity of baron. He died in March 1778, having at that time the laft volume of his work upon infects in the prefs. De Geer had caufed his obfervations on this fubject to be inferted in the Tranfactions of the Learned Societies; but as they increafed, he refolved to publifh them in feparate volumes, the firft of which appeared in the year 1752 under the title of "Memoires pour fervir à l'hiftoire des Infectes." Nineteen years afterwards the fecond volume appeared, and in 1779 the feventh and laft was publifhed. On account of his extenfive knowledge of entomology he was called the Swedifh Reaumur. He was author of "An Oration on the procreation of Infects," and alfo of many papers in the tranfactions of the academies of Stockholm and Upfal. Gen. Biog.

Geer, in *Mining*, fignifies the feagh or refufe fpar and other matters from a mineral vein.

Geer-*barrel*, is the tub or barrel in which the fpar or ore is drawn up the fhaft from the mine, and difcharged on the hillock.

GEERABAR, in *Geography*, a town of Bengal; 8 miles N.W. of Koonda.

GEERAR, a town of Hindooftan, in Oude; 21 miles N.E. of Notchegong.

GEERING, in *Rural Economy*, a term applied provincially to the ladders and fide-rails of a waggon or large cart.

GEERS, a term fignifying the harnefs or trappings of draught or team-horfes.

Geers, in *Mining*, are two pieces of wood fet up like a St. Andrew's crofs, or ×, at each fide of a mine-fhaft, and connected together by other pieces, for fupporting the turn-tree or roll on which the rope winds for drawing up the geer-barrel and ore, or for winding water, and for drawing up and letting down the miners in fome inftances. See Stowse and Turn-tree.

Geers, in a *Ship*. See Jeers.

GEERVLIET, in *Geography*, a town of Holland, in the ifland of Putten; 5 miles from the Brill.

GEESE, a well known fort of bird. See Goose.

GEESEH, in *Geography*, a village of Abyffinia, near the fource of the Nile. N. lat. 10° 59′. E. long. 86° 56′.

GEESTE, a river of Bremen, which fills the ditches of Cailfburg, and runs a little below into the Wefer.

GEETE,

GEETE, a river of Brabant, which runs into the Demer at Helen.

GEEVACH, mountains of Ireland, in the counties of Leitrim and Roſcommon, which contain ſeveral coal-mines; amongſt others thoſe which have been worked at Arigna.

GEFLE, a river of Sweden, which paſſes by the town of the ſame name, and runs into the gulf of Bothnia, about 10 miles below it. Here it begins to be navigable for veſſels drawing 9 or 10 feet of water.

Gefle, or *Giawle*, a town of Sweden, in the province of Geſtricia, on an arm of the gulf of Bothnia, which divides the town, and ſurrounds it; thus forming two iſlands. This town is ancient; the houſes are conſtructed partly of brick or ſtone, plaiſtered white, which have a neat appearance, and partly of wood. It is commercial, has a good harbour, and is the reſidence of many rich merchants; its principal exports are iron, pitch and tar, and planks; many of its inhabitants are fiſhermen; 60 miles N. of Upſal. N. lat. 60° 42′. E. long. 16° 57′.

GEFREES, a town of Germany, in the principality of Bayreuth; 12 miles N.N.E. of Bayreuth. N. lat. 50° 5′. E. long. 10° 50′.

GEFRORN. See Brenner.

GEGADIVAY, a town of Hindooſtan, in the Myſore; 8 miles S.E. of Kiſtnagheri.

GEGE, a river of Pruſſian Lithuania, which runs into the Wilde; 2 miles S.E. of Plaſchken.—Alſo, a town of Hindooſtan, in Cochin; 25 miles E. of Cochin.

GEGENDA, a town of European Turkey, in Bulgaria, on the Danube; 20 miles W. of Nicopoli.

GEGENES, Γεγενεις, in *Antiquity*. The ancients generally called themſelves Γεγενεις, *ſons of the earth*, as Heſychius informs us. Alluding to the ſame original, the Athenians ſometimes ſtyled themſelves Τεττιγες, *graſshoppers*; and ſome of them wore graſshoppers of gold faſtened to their hair, as badges of honour, to diſtinguiſh them from others of leſs antiquity, and leſs noble extraction, becauſe thoſe inſects were believed to be generated out of the ground. Pott. Archæol. Græc. lib. i. cap. 1.

GEGENY, in *Geography*, a town of Hungary; 23 miles E. of Gros Wardein.

GEGLACKE, a town of Pruſſia, in Natangen; 10 miles N.E. of Raſtenburg.

GEGNO, a town of Italy, in the department of the Lario; 3 miles N. of Como.

GEHANPENNA, a town of Hindooſtan; 7 miles N.W. of Delhi.

GEHARCONDA, a town of Hindooſtan, in Candeiſh, on the river Oodah Ootale; 50 miles E. of Burhanpour.

GEHENNA, Γεεννα, a ſcripture term, which has given ſome perplexity to the critics. It occurs in St. Matthew, v. 22. 29, 30. x. 28. xviii. 9. xxiii. 15. 33. Mark, ix. 43. 45. 47. Luke, xii. 5. James, iii. 6.

The authors of the Louvain and Geneva verſions retain the word *gehenna*, as it ſtands in the Greek; the like do M. Simon and the Latin tranſlators; but the Engliſh tranſlators render it by *hell* and *hell-fire*; and the like do the tranſlators of Mons, and father Bohours: but it is indiſputable, that it is employed in the New Teſtament to denote the place of future puniſhment; whereas in the Old Teſtament we do not find this place mentioned in the ſame manner. Accordingly, the word γεεννα does not occur in the Septuagint; and as it is not a Greek word, it is not to be found in the Greek claſſics. It is originally a compound of the two Hebrew words גיא הנם, *ge hinnom*, the valley of Hinnom, a place near Jeruſalem, firſt mentioned in the book of Joſhua, (ch. xv. 8.) It was there that the cruel ſacrifices of children were made, by cauſing them to paſs through fire, to Moloch, the Ammonitiſh idol (2 Chron. xxxiii. 6.) It was alſo called "Tophet," (2 Kings, xxiii. 10.), as it is ſuppoſed, from the noiſe of drums (Toph ſignifying a drum), a noiſe produced on purpoſe to drown the cries of the helpleſs infants. King Joſiah, to render this place for ever abominable, made a cloaca, or common ſewer thereof, where all the filth and carcaſes in the city were caſt.

The Jews obſerve farther, that there was a continual fire kept up there, to burn and conſume thoſe carcaſes; for which reaſon, as they had no proper term in their language to ſignify *hell*, they made uſe of that of *gehenna*, or *gehinnom*, to denote a fire inextinguiſhable.

As this place was, in proceſs of time, conſidered as an emblem of hell, or the place of torment reſerved for the puniſhment of the wicked in a future ſtate, the name "Tophet" came gradually to be uſed in this ſenſe, and at length to be confined to it. This is the ſenſe, as Dr. Campbell (Prel. Diſſ. to the Four Goſpels) conceives, in which gehenna, a ſynonymous term, is always to be underſtood in the New Teſtament, where it occurs twelve times. In ten of theſe there can be no doubt; in the other two the expreſſion is figurative; but the figure is taken, without queſtion, from that ſtate of miſery which awaits the impenitent. Thus, the Phariſees are ſaid to make the proſelyte, whom they compaſs ſea and land to gain, two-fold more a child of hell, υιος γεεννης, than themſelves (Matt. xxiii. 15); an expreſſion both ſimilar in form, and equivalent in ſignification to υιος Διαβολου, ſon of the devil, and υιος της απωλειας, ſon of perdition. In the other paſſage (James, iii. 6.) an unruly tongue is ſaid to be ſet on fire of hell, φλογιζομενη υπο της γεεννης.

GEHMEN, in *Geography*, a town of Germany, and capital of a lordſhip in the circle of Weſtphalia, ſituated on the Aa, within the biſhopric of Munſter. The inhabitants are Lutherans and Calviniſts, each of whom have a church; 16 miles N.E. of Weſel. N. lat. 51° 55′. E. long. 6° 45′.

GE-HO, a town of Chineſe Tartary; 100 miles N.E. of Pekin. N. lat 41° 3′. E. long. 117° 32′.

GE-HOFEN, a town of Germany, in the county of Mansfeld.

GEHRDEN, a town of Germany, in the principality of Calenberg; 6 miles W.S.W. of Hanover.

GEHREN, a town of Germany, in the county of Schwartzburg; 10 miles S. of Arnſtadt.

GEIBENHEIM, a town of France, in the department of the Upper Rhine; 12 miles N.E. of Beforte.

GEJER, Martin, in *Biography*, a learned German, was born at Leipſic in the year 1614, where he was regularly educated. He was created a doctor in divinity, profeſſor of Hebrew, miniſter of St. Thomas's, and afterwards preacher, confeſſor, and member of the eccleſiaſtical council of the elector of Saxony. He died at the age of ſixty-ſeven in the year 1681. He was author of Commentaries on the books of Pſalms, Proverbs, Eccleſiaſtes, and Daniel, and many other works abounding in erudition. Theſe were afterwards collected and printed in two vols. folio. Moreri.

GEIHOUN, in *Geography*, a river of Syria, which runs into the bay of Alexandretta. N. lat. 36° 40′.

GEIKIN, a river of Perſia, which ſeparates the province of Kerman from Mecran, and runs into the Indian ſea; 60 miles S.W. of cape Jaſques.

GEIL, a river which riſes in the county of Tyrol, paſſes through Upper Carinthia, and joins the Drave, near Villach.

GEILENKIRCHEN, a town of France, in the department of the Roer, and chief place of a canton, in the diſtrict of Aix-la-Chapelle. The place contains 431, and the canton 12,245 inhabitants, in 46 communes: 8 miles N.W. of Juliers. N. lat. 50° 57′. E. long. 6° 10′.

GEILGARBEN, a town of Pruſſia, in Samland; 15 miles N.E. of Konigſberg.

GEILSDORF, a town of Saxony, in the Vogtland; 5 miles S.S.W. of Plauen.

GEILSTATT, a town of Germany, in the biſhopric of Bamberg; 3 miles N. of Bamberg.

GEILZHEIM, a town of Germany, in the principality of Anſpach.

GEIRA, a town of Aſiatic Turkey, in Natolia, anciently *Aphrodiſias*, a city of Caria; 60 miles E.S.E. of Guzelhiſar.

GEISEL, a river of Saxony, which runs into the Saale; 5 miles S. of Halle.

GEISELAND, a town of Germany, in the county of Schwarzenburg; 16 miles N. of Schainfeld.

GEISELWINDEN, a town of Germany, in the county of Schwarzenburg; 8 miles E. of Schainfeld.

GEISENFELD, a town of Bavaria; 9 miles S.E. of Ingolſtadt.

GEISENHEIM, a town of Germany, in the circle of the Lower Rhine; 17 miles W. of Mentz.

GEISING, a town of Saxony, in the margraviate of Meiſſen; 20 miles S. of Dreſden.

GEISINGEN, a town of Germany, in the principality of Furſtenberg; 14 miles N. of Schaffhauſen.

GEISLEDE, a river of Germany, which runs into the Leine, near Heiligenſtadt, in the territory of Eichsfeld.

GEISLINGEN, a town of Germany, in the circle of Swabia, on the Kocher, containing two churches; 12 miles W. of Ulm. N. lat. 48° 34′. E. long. 9° 50′.

GEISMAS, a town of Germany, in the principality of Heſſe; 22 miles W. of Gottingen. N. lat. 51° 20′. E. long. 9° 24′.

GEISON. See Gison.

GELSPOLCHEIM, a town of France, in the department of the Lower Rhine, and chief place of a canton, in the diſtrict of Straſbourg; 6 miles S.S.W. of Straſbourg. The place contains 2086, and the canton 11,683 inhabitants, on a territory of 135 kiliometres, in 14 communes.

GEISSELBORING, a town of Bavaria; 9 miles S.W of Straubing.

GEISSERN, a town of the archbiſhopric of Salzburg; 32 miles S. of Salzburg.

GEISSING See, a lake of Carinthia; 12 miles N. of Feitkirchen.

GEISSORRHIZA, in *Botany*, from γεισον, a *penthouſe*, and ῥιζα, a *root*, alluding to the imbricated ſcales which clothe that part. Gawler in Curt. Mag. v. 18. t. 672. Sim's and Konig's Annals of Botany, v. 1. 223. A genus formed by Mr. Gawler, (now Ker Bellenden), out of *Ixia*, from which, according to him, it differs in having inclined ſtamens. Examples of it, beſides the plate above quoted, are *Ixia Rochenſis*, Curt. Mag. t. 598; *ſecunda*, t. 597; and *exciſa*, t. 584.

GEISTOL, in *Geography*, a river of Stiria, which runs into the Kainach, near Moſkirchen.

GEITHAYN, or Geithen, a town of Saxony, in the circle of Leipzig; 20 miles S.S.E. of Leipzig. N. lat. 51° 2′. E. long. 12° 39′.

GEKELEMUEKPECHUENK, a town of America, belonging to the Delaware Indians, on a creek of the ſame name, a head-water of the Muſkingum. This was the northernmoſt Moravian ſettlement of Muſkingum river. It lies 12 miles N.E. by N. from Salem, and 78 N. weſterly from Pittſburg.

GEKKO, and Gekkones. See Lacerta.

GELA, in *Ancient Geography*, a town of Sicily, ſituated on the ſouthern coaſt at a little diſtance from the ſea, near the river Gela. This city was built by Antiphemus of Rhodes and Entimus of Crete, 713 years before the Chriſtian era. The ruin is now called "Fiume di Terre Nuova."

GELÆOPACHIA, in *Natural Hiſtory*, the name of a claſs of mineral fluids, which are inflammable, and of ſomewhat thick texture, and opake. The word is derived from the Greek γη, the *earth*, ελαιον, *oil*, and παχυς, *thick*. The bodies of this claſs are the Barbadoes tar, oil of earth, and the common piſſaſphaltum of the ſhops; which ſee under their ſeveral heads.

GELÆOPSILA, the name of a claſs of foſſils. The word is derived from the Greek γη, *earth*, ελαιον, *oil*, and ψιλος, *thin*, and expreſſes a thin oily ſubſtance naturally found in the earth. Theſe are thin and pellucid inflammable liquid ſubſtances, commonly known by the name of liquid bitumens, but by that denomination confounded with the thicker and coarſer kinds. The only bodies of this claſs are thoſe commonly diſtinguiſhed by the names of naphtha and petroleum.

GELALEAN Calendar. See Calendar.

GELANDRI, in *Ancient Geography*, a town ſituated on the bank and to the right of the river Danapris (the Dnieper), near the fourth cataract of this river.

GELASANI Dentes, a term uſed by ſome authors to expreſs the four middle fore-teeth, both of the upper and under jaw. They have their name from the Greek, γελος, *laughter*, becauſe they are ſhewn when people laugh.

GELASIUS I., in *Biography*, an African by birth, was admitted to the papal dignity in the year 492, on the death of Felix III., to whom he had been ſecretary. He was, almoſt immediately after his inſtallation, engaged in a diſpute with Euphemius, patriarch of Conſtantinople, reſpecting the name of Acacius being eraſed from the ſacred diptychs, or regiſters. Euphemius contended that the people and clergy would not and ought not to ſubmit to ſuch an indignity on the memory of their patriarch. To this repreſentation, Gelaſius replied in a moſt arrogant ſtyle, and declared his fixed reſolution not to be reconciled to the church of Conſtantinople while the name of Acacius was kept in the diptychs. This obſtinacy of the pope gave great uneaſineſs to the Catholic biſhops of the Eaſt, who were ſenſible of the advantage which the Eutychian party would derive from the continuance of the breach between them and Rome; and they applied to the ambaſſador, Fauſtus, who wrote to the pope, appriſing him of the fatal conſequences which they apprehended to their cauſe, if he ſhould perſiſt in his reſolution. The pope was, however, inflexible, till at length the eaſtern biſhops ſeparated themſelves from the communion of Rome, ſtruck out the name of Gelaſius from the diptychs, and unanimouſly reſolved neither to communicate with him, nor with any perſon who ſhould do ſo. Thus the pope loſt the moſt favourable opportunity of healing the ſchiſm which ſubſiſted between the eaſtern and weſtern churches. The breach was, indeed, during his pontificate, made much wider.

In 494, Gelasius wrote letters to the bishops of Dalmatia, and afterwards to those of Dardania, justifying his own conduct in the business of Acacius; and urging them to oppose with vigour the Eutychians and Pelagians, and to treat them as enemies to the church, and rebels to St. Peter. In the year 495, he held a council of forty-six bishops at Rome, at which was re-admitted to the communion of the church, and to his episcopal rank and see, Misenus, bishop of Cumæ, who had been deposed and excommunicated under the pontificate of Felix III. for communicating with Acacius. Before, however, sentence of absolution was pronounced in favour of Misenus, he was obliged solemnly to declare that he condemned, anathematized, and for ever execrated all who held communion with Acacius, or lived in communion with his successors and abettors. During the papacy of Gelasius, the Manichæan sect began to revive at Rome, on which occasion he issued a decree, by which all persons who embraced their sentiments were condemned to banishment, and their books burnt: and as it was customary with those who were tinctured with their opinions to receive only the bread at the celebration of the Sacrament of the Lord's Supper, but to refuse the wine, he condemned that practice in the strongest terms, and ordered those who refused the communion in both kinds, to be excluded from either, "because," said he "one and the same mystery cannot be divided without sacrilege." Gelasius died in the year 496, having filled the high office of pope almost five years. He was author of many works, some of which were written avowedly in justification of his own conduct in suppressing heresies, and in the absolution of Misenus. His most celebrated piece is "A Treatise against Eutyches and Nestorius, concerning the two natures of Christ. As many of his other productions were inserted in the "Collectio Conciliorum," so this was inserted in the eighth volume of the Biblioth. Patrum. Gelasius is thought to have been the author of the "Codex Sacramentarius," which is a collection of such forms of public prayers and administrations of the sacraments as were in use in the church of Rome in his time, digested in a new order, and including many additional forms of his own. The manuscript of this codex was unnoticed for many ages, till, at the dispersion of the Florentine library, it fell into the hands of Paul Petau, by whose son it was placed in the library of Christina, queen of Sweden; at her desire it was printed, for the first time, at Rome, in 1680. Moreri. Bower.

Gelasius II. pope, was born of an illustrious family at Gaeta, in Campania. In early life he embraced the monastic state among the Benedictines, applied himself with great diligence to his studies, and acquired a high character for learning, abilities, and virtue. Pope Urban II. made him his secretary, and in the year 1088 preferred him to the dignity of cardinal deacon. Not long after this he was appointed chancellor of the Roman church. Upon the death of pope Paschal, in 1118, he was unanimously chosen his successor by the cardinals and Roman clergy, when he, who had been known before by the name of John of Gaeta, on account of the place of his birth, assumed the title of Gelasius II. The imperial party at Rome were so enraged at this choice, which had been made without their consent or knowledge, that Frangipani, one of the most powerful of the Roman nobility, assembled a body of armed men, broke into the church of the Benedictine monastery, while the cardinals were performing the ceremony of the adoration, and after cruelly beating these defenceless men, Frangipani ordered the new pope, who was already covered with blood, to be put into irons and taken to his house, where he was thrown into a dark dungeon. This act did not go unrevenged: the opposite party surrounded the house of Frangipani, with the prefect of the city, and others of the nobility at their head, threatened to set fire to it, and to put him and his family to death, if the pope were not immediately released. This threat produced the desired effect, the pope was liberated, and immediately after crowned with due solemnity. The emperor next took a violent part against him, and caused the archbishop of Braga to be chosen to the pontifical chair, who took the name of Gregory VIII. and was acknowledged lawful pope by all the imperial party at Rome. At first Gelasius was obliged to leave the papal city, and to seek refuge at Gaeta, his native place, where he was received with loud acclamations, and had ambassadors sent to him by the Norman princes, who declared themselves ready to support him to the utmost of their power. Upon the emperor's retreat, Gelasius returned privately to Rome, where he supposed his party was sufficiently strong to drive his rival from the throne. But, during the first public performance of mass, Frangipani forced his way into the church, accompanied by a large body of troops, intending to seize on Gelasius, and send him prisoner to the emperor. The pope, however, escaped, and, his friends flocking together from all parts, a civil war commenced in Rome, in which numbers of lives were lost on both sides. The imperial party at length prevailed, and Gelasius, despairing of being ever able to expel his rival, quitted Italy, and embarked for France, where he arrived in November 1118. Here he was received with all possible marks of respect and esteem, and supplied by the clergy and nobility with large sums of money, in order to support him in his rank and dignity. The reigning monarch, Louis the Gross, sent him the most magnificent presents, with assurances of his protection, and assistance in fixing him again on his throne. He died, however, in January 1119, having first visited several cities, in the exercise of his pontifical functions, and appointed a council to meet at Rheims to consult about the correction of the state of ecclesiastical discipline in the Gallican churches. He was distinguished for piety and the most exemplary moral virtues. In the Collectio Conciliorum are ten letters written by this pope. He was author of the "Life of Erasmus," bishop of Gaeta, and also of the "Lives of Anatolia and Cæsaria:" the first was written in prose, the others in verse. Moreri. Bower.

Gelasius, bishop of Cæsarea, was chosen to that high office in the year 380. He is classed, by St. Jerome and others, among the ecclesiastical writers of his age. He wrote several works, which have been commended for the correctness and purity of their style, but which he would not publish. Some fragments of the writings of this prelate, explanatory of the apostles' creed, and of the traditions of the church, are to be met with in the Greek collection of testimonies, under the name of John Damascenus, in the Codex Claromont. He died in 394.

Gelasius, surnamed *Cyzicenus*, from the place of his birth, was son of a presbyter of the church at Cyzicum, and flourished about the year 476. When young, he found in his father's possession a MS. containing an account of the proceedings of the council of Nice. As the Catholics were at this period persecuted by the Eutychians, under the countenance of the emperor Basiliscus, and as that sect boasted that the decrees of the council of Nice were favourable to their principles, Gelasius determined to draw up a new history of that council, with a view of confuting their representations. He divided his work into three books; of which the two first contain the history of the council, and the third only three letters of the emperor Constantine.

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This hiſtory, which is, in fact, nothing more than a collection of treatiſes, was publiſhed at Paris, by Robert Balfour, a Scotchman, in Greek and Latin, in 1559. It is inſerted in the ſecond volume of the Collectio Conciliorum. But Dupin ſays, that "There is neither order in his narrative, nor correctneſs in his obſervations, nor elegance in his expreſſions, nor judgment in his choice of matter; ſo that he muſt be pronounced a bad compiler who has collected, without any diſcrimination, whatever he found relating to the council of Nice, whether good or bad, not examining even whether it were true or falſe." Moreri. Dupin.

GELATIN, or Animal Jelly, in *Chemiſtry*, a principle that abounds in various parts of animals, and forms one of the elementary conſtituents of animal organization. This principle is copiouſly contained in ſkin, in moſt of the ſoft and white parts, in bone, horns, and membrane, and in a ſmaller proportion in the blood, and alſo in many ſhells. From theſe ſubſtances it may be extracted by boiling in water. The watery ſolution is nearly tranſparent and colourleſs, and when allowed to evaporate and cool, it aſſumes the conſiſtence of *jelly*, which is well known. (See Jelly.) By further evaporation, this watery ſolution becomes hard and brittle, and forms *glue* or *ſize*, which ſee reſpectively.

The chemiſt is very much indebted to Mr. Hatchett's valuable experiments on gelatin, and the ſubſtances from which it is obtained. For curious and uſeful information on this ſubject, (ſee Phil. Tranſ. vol. xc.) Pure gelatin is inſipid, tranſparent, inodorous, and nearly colourleſs, or only exhibiting a ſhade of yellow. When dry gelatin is thrown into water, it abſorbs the water, ſwells, ſoftens, and becomes very elaſtic. It is not diſſolved whilſt cold, and if it be again expoſed to a warm dry air, it ſhrinks and regains its former conſiſtence. But by the application of heat to gelatin, when it is thus ſwelled by ſoaking and immerſed in more water, it forms a ſolution, exactly reſembling in chemical qualities the liquor from which the dry gelatin was prepared, of the ſame denſity, and again glutinous by cooling. It appears therefore to be an inherent and a very characteriſtic property of gelatin, that it is ſoluble in water and recoverable from the ſolution by evaporation, unaltered for an indefinite number of times, even after long application of boiling heat. In this reſpect it eſſentially differs from the ſolution of albumen, which coagulates by heat, and does not again return to its ſoluble ſtate. See Albumen.

Gelatin of every kind is ſoluble in all the acids; and as the nitric acts upon it with particular energy, it may thus be ſeparated from the condenſed albumen, which is often naturally combined with it. The nitric ſolution of gelatin (*e. g.* of iſinglaſs) is of a pale yellow colour, which becomes deeper by evaporation. When much concentrated, the acid, acting at firſt merely as a ſolvent, is decompoſed by the gelatin, and gives out nitrous gas, ſometimes attended with ſparks or flame. This mutual decompoſition of nitric acid and gelatin produces alſo a quantity of the oxalic and malic acids, which may be detected in the liquor, if the concentration has not proceeded ſo far as again to decompoſe theſe new products. The acid ſolutions of gelatin give no precipitate when ſaturated with any of the alkalies or earths.

The muriatic acid diſſolves gelatin in the cold with great eaſe, and, like the nitric, ſeparates it from the denſe albumen of organized bodies, with which it is naturally combined:—and the muriatic ſolution will remain unchanged for many months.

The cauſtic fixed alkalies very eaſily diſſolve gelatin, and form a browniſh viſcid ſubſtance; giving out no ammonia during the ſolution. This viſcid alkaline ſolution, as Mr. Hatchett obſerves, does not poſſeſs the properties of ſoap, for it does not form a permanent lather when ſhaken with water, and when ſaturated with acid it affords no precipitate. This circumſtance, according to Mr. Hatchett, affords a very characteriſtic property, diſtinguiſhing pure gelatin from albumen, fibrin, and moſt other ſoft parts of animals; all of which latter form a true ſoap with alkalies, that curdles and precipitates on ſaturation with an acid.

Gelatin is inſoluble in pure alcohol, and when this ſpirit is poured into a watery ſolution of gelatin, the mixture becomes milky, and part of its gelatin ſeparates, as is the caſe with vegetable mucilages and alcohol; but unleſs a very large quantity of ſpirit is added, the mixture again becomes clear.

Hard and dry gelatin will remain unchanged for a long time; but when liquid, or in the thin gelatinous ſtate, it ſoon putrefies, becoming firſt ſour by the generation of acetic acid, then mouldy and fetid, and at laſt exhaling ammonia.

When dry gelatin is very much heated, it curls and becomes puffy, and yields an oily ammoniacal liquor, like all other ſoft parts of animals. In cloſe veſſels it leaves at laſt a bulky ſoft coal, the proportion of which, determined by Mr. Hatchett, is 56 grains from 500 of iſinglaſs. This by incineration in open air burns away entirely, except 1.5 gr. of earthy reſidue, which appears to be the phoſphats of ſoda and lime. Hence it appears that the quantity of earthy and ſaline matter is extremely ſmall, compared with that of the other ſoft parts. The ſame chemiſt alſo obſerved a kind of artificial converſion of condenſed albumen into gelatin by long digeſtion in dilute nitric acid; the albumen thereby becoming perfectly ſoluble in water, and forming a gelatinizing ſolution when reduced by evaporation.

The moſt ſingular combination of gelatin, and that which is moſt uſeful as a chemical teſt, is with tan. If a ſolution of gelatin, *e. g.* of glue or of iſinglaſs, be added to an infuſion of oak-bark, galls, catechu, or any other vegetable that contains the tanning principle, a copious white precipitate ſeparates, which, after the concentration of the liquors, may be very eaſily collected by the fingers, and forms a ſingular grey ductile maſs, ſmelling like tanned leather, and which runs into a dark brown brittle maſs, appearing like reſin, inſoluble in water, and incapable of putrefaction. For a further account of this combination, ſee Tan. The power of infuſion of tan as a teſt of gelatin is very extenſive. Dr. Boſtock found (Edinb. Med. and Phyſ. Journ.) a copious and immediate precipitate on adding a moderately ſtrong infuſion of galls to water, holding only [illegible] of iſinglaſs, and a very conſiderable precipitate when the gelatin was only [illegible]. The ſolutions of albumen alſo give a precipitate with tan, after ſtanding together ſome hours; and therefore, when uſed as a teſt, an immediate precipitate with tan may be conſidered as a pretty certain indication of gelatin.

The nitro-muriate of tin produces alſo a white precipitate with gelatin; but unleſs the ſolution of the latter is pretty ſtrong, the effect is only a white cloud, after ſome hours ſtanding. Nearly the ſame effect is produced with the ſolutions of albumen.

Mr. Hatchett obſerves, that the difference in the degree of viſcidity and tenacity of the varieties of gelatin is an inherent quality, and not cauſed by the degree of mere inſpiſſation; otherwiſe, when each variety was perfectly dry, they would each make a glue or cement of exactly the ſame degree of tenacity, which is known not to be the caſe. On the contrary, the tenacity depends partly on the age of the animal, the old giving a much ſtronger glue, *cæteris paribus*, than the young; and partly on the ſubſtances that furniſh it, the

the glue from the ſkin being much ſtronger than the ſolid gelatin from the horns, ſinews, or any other part. In proportion as the glue is more adheſive, it becomes leſs eaſily ſoluble in water, and abſorbs a larger portion before it comes to the ſtate of tremulous jelly. Mr. Hatchett alſo found, that the force of adheſion of glue from ſkin was generally proportionate to the toughneſs of the ſkin: the ſoft flexible ſkins yielding a thinner gelatin than the hard bony ſkins, and with much more eaſe Phil. Tranſ. ubi ſupra. Aikin's Dictionary of Chemiſtry, &c. See GLUE, JELLY, ISINGLASS, and SIZE.

GELATINOUS, is applied to any thing approaching the glutinous conſiſtence of a jelly.

GELATIO, properly ſignifies freezing, but is alſo uſed for that rigidity of the body and limbs, which comes on in the catalepſis, and other diſorders of that kind.

GELBFREUTH, in *Geography*, a town of Germany, in the principality of Culmbach; 10 miles S.S.W. from Culmbach.

GELBUM, a name given by the Hungarian miners to a ſort of marcaſite or mundic, which contains a conſiderable quantity of ſilver.

GELD, or GILD, in our *Ancient Cuſtoms*, a mulct, or compenſation for a crime or delinquency. See GILD.

Hence *wergild* was anciently uſed for the value or price of a man ſlain; and *orſgild*, of a beaſt, &c.

"Et ſint quieti de Geldis, & Danegeldis, Horngeldis, & Fortgeldis, & de Blodwita, & Fliwita, & Leirwita, & Heingwita, & Freminefeuda, & Werdpens, & Averpeni, & Hundrepeni, & Tolingpeni." Charta Ric. II. Priorat. de Hatland, in Devon.

GELD *foot*, *Geld horn*, and *Geld wood*, ſee the ſubſtantives.

GELDA, in *Ancient Geography*, a town of Aſia, in Albania, between the mouths of the rivers Gherrus and Caſius, in the Caſpian ſea. Ptol.

GELDENHAUR, GERARD, in *Biography*, was born at Nimeguen in 1482. He was educated partly at Daventer, and partly at Louvain, where he contracted an intimacy with Eraſmus. When he had left the college, he was recommended to Charles V. who appointed him his reader and hiſtorian; after this he accepted the poſt of Latin ſecretary, and private reader to Philip biſhop of Utrecht, which he held till the death of that prelate. In 1526, he was ſent by Maximilian of Burgundy to examine the ſchools of Wittemburg. He now openly joined the Lutheran party, went to Worms, was married and undertook the education of youth. Eraſmus was diſpleaſed with his change of religion, and wrote againſt him. Geldenhaur removed firſt to Augſburg, and then to Marburg, where he was the firſt profeſſor of hiſtory, and afterwards of theology. He died in 1542. He was author of ſome pieces in controverſial theology; he publiſhed likewiſe Latin poems, orations, and epiſtles, and ſome hiſtorical works, of which the principal are "Hiſtoriæ Batavicæ;" "Hiſtoriæ ſuæ Ætatis, lib. vii." "Germanicarum Hiſtor. Illuſtratio;" "Deſcriptio Inſulæ Batavorum;" "De viris illuſtribus Inferioris Germaniæ." Moreri. Bayle.

GELDER, ARNOLD DE, a painter who was born at Dort in 1645. He firſt became a diſciple of Hoogſtraten, but afterwards ſtudied under Rembrandt, and made very conſiderable progreſs in the imitation of that maſter's manner; having a mind inclined to the ſame mode of obſerving and thinking. He remained two years with him, but did not, like the generality of ſtudents, attach himſelf to the ſtudy of the maſter's pictures only; he adopted his mode of ſtudying from nature, and, like him, made a collection of a large ſtock of thoſe articles his taſte led him to wiſh to imitate: ſuch as arms, and draperies of all ſorts; covering his walls with them, and conſtantly employing them in his backgrounds and on his figures. His principal work is a ſeries of twenty-two pictures of the ſufferings of Chriſt, which are famed for excellent chiaro-ſcuro and expreſſion. He died in 1727, aged 82.

GELDER-*Roſe*, in *Botany*. See VIBURNUM.

GELDER-*roſe*, *currant-leaved*, and *Virginian*. See SPIRÆA.

GELDING, in *Rural Economy*, a term by which young caſtrated horſes are frequently known. The term is ſeldom applied to them after they have attained the age of three years. See CANTHERII and next article.

GELDING, the operation of cutting or caſtrating any ſort of animal. The age of the animal and ſeaſon of the year, ſhould be well attended to in the execution of this buſineſs. Colt-foals and tup-lambs may be gelded with advantage in moſt caſes at a very early period of their age, as at a fortnight or three weeks after they are dropped, though ſome prefer a later period for both theſe, but eſpecially for male-foals. In general, however, where the operation is performed early, the animal ſooner recovers its growth, and ſuffers much leſs check. In horſes it may however be executed at almoſt any age, where a due degree of care is afterwards taken of the animals.

In reſpect to ſeaſon, the beſt is, when a little inclined to be cool, as in the beginning of the ſpring and in the autumn.

The uſual method of proceeding in the performance of the buſineſs, is, with foals and ſtallions, firſt to caſt them upon ſome ſoft place, then to take the *teſtes* between the foremoſt and the great finger, ſlitting open the ſcrotum or bag with a ſharp knife for the purpoſe, and forcing them forward, in order that they may be laid hold of by the fingers, or a pair of ſmall nippers made for this uſe, and by that means be cut away; the ſpermatic veſſels being properly ſecured by ſtrong waxed thread ligatures. The old method was to ſear them off by a thin red hot cauterizing iron. The only thing neceſſary afterwards in the firſt mode is, merely to keep the ſides of the ſcrotum in contact. But in the old way a compoſition of roſin, wax, and turpentine, well melted together, is uſually laid over the parts by means of the hot iron. While under this treatment the animal ſhould be kept looſe in a moderately warm ſtable, in order that he may have proper exerciſe in walking about in it. In caſes where there is much appearance of inflammation, it may ſometimes be neceſſary to take away a little blood. And if the ſheath and belly ſhould become ſwollen, diſcutient fomentations ſhould be frequently applied.

In the gelding of animals of the ſheep kind, leſs trouble is commonly neceſſary, the ſhepherd moſtly performing the buſineſs. See CASTRATION.

Pliny informs us, that the Romans uſed to geld their horſes, eſpecially thoſe which they employed upon common and domeſtic occaſions; and geldings, called *Cantherii*, (which ſee,) were preferred, on account of their calmneſs of temper, to other horſes. The nations of Africa, and of Aſia, except the Chineſe, never geld their horſes; and ſome kingdoms of Europe have not yet adopted the practice. Caſtration deprives the animal of a conſiderable part of his ſtrength, ſpirit, and courage; robs him, (ſays Berenger, Hiſtory of Horſemanſhip, vol. i. p. 138) in part, of his very *ſoul*, and leaves him a mutilated, daſtardly, and unnatural creature; but, at the ſame time, makes him mild, patient, more obedient, and conſequently fitter for many purpoſes, and more agreeable to many riders. To this purpoſe Strabo obſerves, (l. 7.) that caſtration, which, indeed,

was practiſed long before he wrote, was a cuſtom more peculiarly belonging to the Scythians and Sarmatians than any other nations; and they performed this operation on their horſes, for the better management of them: for though they were but ſmall, they were neverthelefs mettleſome, and difficult to be governed. The practice of gelding horſes, which is now ſo frequent, ſeems to have been introduced by the Turkiſh or Hungarian nations, who took poſſeſſion of ancient Pannonia. The French, it is obſerved, call a gelding "un cheval Ongre," that is, an Hungarian horſe, which ſeems to indicate, that the Franks firſt learned the art and cuſtom of caſtration from the Hungarians: and it is remarkable, that to this day many Hungarians travel every year into Germany and Poland, in order to caſtrate any animal that is offered to them, which they do for a ſmall reward. It is ſaid, that they come as far as the Baltic every ſummer, and that they are very expert in their buſineſs.

GELDUM, a name given by ſome to the philoſopher's ſtone.

GELE'E Claude, in *Biography*, a landſcape painter, whoſe works entitle him to the foremoſt rank in his claſs. He was a native of Lorraine, and hence bore the name of Claude de Lorraine, by which he is better known than by his own. Notwithſtanding the extraordinary brilliancy of his talent, when devoted to painting, and fully developed in proceſs of time by continued induſtry, and proved by the grandeur and correctneſs with which he ſelected and imitated the works of nature, he appears to have been with difficulty brought forward at firſt in the art. His original eſſays of ingenuity were in the habit of a paſtry-cook, to which occupation he ſerved an apprenticeſhip. How he emerged thence, and what led him to think of painting, is not at preſent known.

Claude received ſome inſtructions from Agoſtino Taſſi, who, ſo far from finding him an apt ſcholar, with difficulty taught him the firſt rudiments of perſpective and drawing. When once, however, he began to feel their truth and force, his native ſtrength of intellect ſoon carried him beyond the ſphere of his maſter. His mind, expanding in the courſe of his ſtudies, was a ſpur to his induſtrious purſuit of the beauties of the goddeſs he adored; and never painter more truly may be ſaid to have unveiled thoſe beauties. By no one has nature been more happily pourtrayed than by this great maſter, in the art of painting.

His courſe of ſtudy was the moſt rational and uſeful that can be adopted. He conſtantly had recourſe to nature herſelf. His continual examination of her effects, and their cauſes, is the genuine ſource of that excellence to which he arrived. The open canopy of heaven was his ſtudy. It was there he conſtantly wrought, ſketching whatever was beautiful or grand; exploring the forms of natural objects, and noting their colours as they varied with the changes of light and ſhade; of combination with others, and ſeen with reflections from ſurrounding objects; or when alone, and tranſmitting the pure ethereal ray tinged with their own peculiar hues. For this purpoſe he frequently continued abroad from ſun-riſe, till the darkneſs of night compelled him, unwillingly to withdraw from his contemplations.

Sandrart ſays of him, that he was philoſophically informed; that he not only was capable of repreſenting the ever-varying productions of nature, but of reaſoning upon them, and explaining the cauſes of their different appearances; whether ariſing from diſtance, from dews and vapours, the evening or the morning light, or from differing reflections and refractions of light; and that he would do this with the clearneſs and preciſion of a man of ſcience.

The earneſtneſs with which he ſought to perfect his pictures, is evident in the labour he beſtowed upon them. To produce the ſurface they bear, numerous repetitions of colour are neceſſary; and that will only be done by thoſe who have their minds fraught with objects, which their hands do not readily perfect the reſemblance of. Their perception of truth is too ſtrong for their knowledge of the means of imitation; and therefore frequent reviſals and retouchings are neceſſary to ſatisfy them in purſuit after the actual repreſentation of nature. Claude felt all this, and brought his pictures accordingly to a high degree of perfection, by conſtantly ſuperviſing his labours with a ſtrong remembrance of the real objects; and not unfrequently altering his deſigns, and repainting them, till they perfectly correſponded with the images in his mind.

His deſigns are, for the moſt part, very agreeable, often grand, and entirely differing from the taſte of any one who had preceded him in landſcape painting. Titian and the Carracci had given a grandeur of ſubject generally derived from the more rugged ſcenes of nature. Claude, on the other hand, ſelected and united the beautiful with the grand; and aſſociated art and nature together, by the introduction of buildings into his pictures, with the greateſt propriety and richneſs of effect. The former, in their landſcapes, have not always preſerved the character of nature: there is much of the artificial apparent in them, either to command the attention of the obſerver by the force of colour, or from ſome error in the ſyſtem of art they uſed. Claude, on the contrary, never had recourſe to it; a cloſe imitation of the effect of nature was his object; and a perfect harmony of colour, of courſe the means he employed. No one, except it be our own Wilſon and Turner, have ſo completely given the effect of atmoſphere, ſo enveloped his objects with air, and relieved them ſo truly without apparent artifice from each other. Regarding a picture painted by him, is the ſame as looking into nature; his diſtances are duly kept, with ſo full, yet ſo tender an indication of the objects in the remote parts, as completely to dazzle the underſtanding when ſeen under favourable circumſtances. His colouring is of the moſt ſubtle nature, being the reſult of repetition of one colour, or layer of colour, over another; not of the tones mixed upon the pallette; and completely baffles all attempts to imitate it, except by the ſame means; which renders him extremely difficult to copy. It is not eaſy to ſay whether the luſtre which is ſo pre-eminent in his pictures be effected by the oppoſition of light and dark he uſes, the purity of his hues, or the breadth of his chiaro-ſcuro. His ſkies appear to poſſeſs an inherent light, reflecting and diſpenſing it upon the eyes of the beholders, as well as on the objects in the pictures.

The compoſitions of his larger works are principally combinations of the ſcenery ſurrounding Rome, and other places where he reſided. He took great care in the forms of his trees. As to what is ſaid by Pilkington, of his nicety of diſcrimination in repreſenting the various characters of the plants and trees he introduced; it does not appear to have been his practice in his beſt works. There is difference enough to give the appearance of nature; a fir tree grows differently from an oak, or a ſycamore, &c.; this he has marked occaſionally; but in general, his trees have one character ſelected from nature, as conveying the impreſſion of grandeur and beauty in the vegetable creation: and ſameneſs of form is rather imputed to him by ignorant obſervers. His choice, however, is perfectly juſtifiable, upon the ſame principle as that of the hiſtorical painter, who ſelects a general, rather than a peculiar, form of the human figure for his imitation.

The figures of men and animals which he introduced into his

his pictures, exhibit the effect of his unfortunate commencement in art, by their total want of drawing, and freedom of action. The idea which governs their introduction almost invariably excels their execution, notwithstanding he took much pains to learn to draw in the academy at Rome, after statues and living models. He was himself conscious of his deficiency on this head, and frequently engaged other artists, such as Felippo Lauri, and Courtois, to paint them for him, particularly his men and women.

In order to prevent copies of his works being sold as his painting, and thus becoming injurious to his reputation, and to avoid frequent repetition of the same subjects; he drew, in a book prepared for the purpose, the designs of those pictures he transmitted to different countries, and wrote upon the back of the drawings the name of the person to whom the original picture was sold. This book is now in the possession of the duke of Devonshire, who has kindly allowed it to be engraved by Earlom, in a manner closely imitating the appearance of the drawings, and it is published under the title of "Liber Veritatis."

We have many of the finest works of this great master in this country, besides an infinity of minor productions from his pencil. The principal ones here, are one in possession of the earl of Egremont, wherein the story of Jacob, Laban, and his daughters is introduced, and which has been engraved by Woollett. Another in possession of Mr. Angerstein, of the story of the queen of Sheba's departure to visit Solomon; and a third in possession of Mr. Davis brought from the Altieri palace in Rome, and which has been valued at 7000 guineas. These are master-pieces of their kind, for grandeur, richness, and variety of imagination in their different compositions; and for brilliancy, luxuriancy, and truth in their colour. He died in 1682, aged 82. "When shall we look upon his like again!!"

GELEITSTEIN, in *Geography*, a town of Germany, in the principality of Wurzburg; 10 miles S. of Gemunden.

GELEMAR, a town of Hindoostan, in Oude; 26 miles S.W. of Gooraepour.

GELENAU, a town of Saxony, in the circle of Erzgeburg; 5 miles W.N.W. of Greiffenstein.

GELFUM, or GELBUM, an Hungarian name for a kind of mundic, which contains silver.

GELIGONDA, in *Geography*, a town of Hindoostan, in the Carnatic; 50 miles S.W. of Ongole.

GELISE, a river of France, which runs into the Baise at Lavardac.

GELLA, in *Ancient Geography*, a town of Hispania Tarragonensis, in the country of the Vaccæans; supposed to be the *Tela* of Antonine's Itinerary.

GELLAH, or COLLAH, or *Galleh ad Snaan*, a town of Algiers, in the province of Constantina, near the river Serratt; built upon the eminence of a mountain, and having only one narrow road leading to it. This place is a kind of convenient asylum for the rebels of both this and the neighbouring kingdom, where they are hospitably entertained, till their friends have procured their pardon, or compounded for their crimes; 86 miles E. of Constantina.

GELLAH, a town of Africa, in the kingdom of Tunis, situated on a rugged promontory, to which it gives name, near the river Mejerdah: it was near this place that Publius Cornelius Scipio fixed his winter-quarters, which gave it the name of "Castra Corneliana;" 18 miles N. of Tunis.

GELLE', a town of Africa, in Dar-Fûr, at a small distance N.W. of Cubcabia, and 40 miles N.W. of Cobbé. N. lat. 14° 24'. E. long. 27° 28'. Gellé, says Mr. Brown, (Travels in Africa, &c. p. 240.) was esteemed less flourishing than most other towns of Dar-Fûr, being under the galling tyranny of a priest, a native of the place, and upon whom the inhabitants were dependent. His unsated avarice left them neither apparel nor a mat upon which to lie; and his malice persecuted them, because they had nothing more which he could plunder.

GELLERT, CHRISTIAN FURCHTEGOTT, in *Biography*, was born in July 1715, near Freyburg, where his father was a clergyman. He received a good education in the schools, and in 1734 studied theology at Leipsic. At the end of four years he returned home, and commenced preacher, but making no figure as an orator, he undertook the office of a private tutor. At this period he exhibited a poetical taste, but his first attempts as an author were entitled, "Amusements of Reason and Wit," which procured him a great deal of respect, as well for the agreeableness of his style, as for the excellence of disposition which his work every where displayed. As an instructor of youth, he endeavoured not only to enrich the minds of his pupils with useful knowledge, but to form their taste, improve their hearts, and inspire them with sentiments of religion and virtue. In 1744, he published the first volume of his fables, some plays, and the first original German romance worth any notice. The second volume of his fables was published in 1748. He had always laboured under much ill health, and was subject to hypochondriacal affections, and, in 1751, he accepted the office of extraordinary professor of philosophy. He had not enjoyed the emoluments of his situation many months, when his complaint degenerated into insuperable lowness of spirits, and confirmed melancholy, which embittered all the joys of life. In this state, beloved by all, on account of his patience and Christian resignation, he continued to linger out a miserable existence till December 1769. The loss of him was sincerely and deeply lamented by his countrymen, to whom he had been a general instructor. "Every person," says his biographer, "who was capable of holding a pen, suddenly turned writer in his praise." His works were very numerous, and were published in ten volumes octavo, in the year 1766, and after his death a more complete edition was published at Leipsic, in eight volumes, with engravings. Kutner has celebrated his various excellencies; he says, "a century will perhaps elapse, before we have another poet capable of exciting the love and admiration of his contemporaries, in so eminent a degree as Gellert, and of exercising so powerful an influence on the taste and way of thinking of all ranks." Though not a genius of the first class he was an agreeable and fertile writer; the poet of religion and virtue; an able reformer of public morals, who preferred reproof to punishment, and seemed more inclined to administer consolation, than to plunge into despair. In his fables and spiritual songs he has displayed the whole force of his genius. In the former, he successfully imitates La Fontaine, and shews the same delicate vein of humour, the same liveliness and ease united to the keenest satire. In his tales properly so called, he seems fond of the serious, didactic style, and sometimes of the tragic. His ridicule always appears in the garb of innocence, while the irony is concealed under the finest veil; his verses are exceedingly soft and harmonious, and it may be easily seen that many of them are the fruit of long study and meditation. His prose is not destitute of elegance, but it is inferior in strength and fire to his more juvenile productions. No literary man was ever readier to allow the superior merit of others. He set a great value on talents which he himself did not possess, and preferred learning to genius. As he required only a small portion of the pleasures or indulgences which money can procure,

procure, a fmall income was more than fufficient to fupply all his wants, and he devoted a confiderable part of it to acts of beneficence. As long as the Germans fhall underftand their prefent language, will the works of Gellert be read; and his character will be honoured while virtue is known and refpected." Gen. Biog.

GELLHEIM, in *Geography*, a town of France, in the department of Mont Tonnerre; 13 miles W. of Worms.

GELLI, Giambatista, in *Biography*, an Italian poet, was born at Florence in 1498, of mean parents, who brought him up to the mechanical trade of a fhoemaker. They had, however, given him the beft education which their circumftances could afford, and he became diftinguifhed for literature, and was, in the end, one of the chief ornaments of the academy Degli Umidi. He wrote two comedies, entitled "La Sporta" and "L'Errore," which were accounted the beft compofitions of the kind then in the language. He tranflated the Hecuba of Euripides, from the Greek into the Italian. He was author of feveral other works, fome on phyfical fubjects; Differtations upon the poems of Dante and Petrarch; Tranflations and Remarks on the difficulty of reducing the Italian language to rule, &c. Gelli died in 1563. Moreri.

GELLIBRAND, Henry, was born in London in the year 1597. Having paffed through the elementary parts of education, he was admitted a commoner of Trinity college, in the univerfity of Oxford, where, in the year 1619, he took his degree of B. A. Upon accidentally hearing one of fir Henry Saville's lectures on mathematics, he conceived a ftrong inclination for the ftudy of the fciences, and devoted himfelf to the purfuit with fo much vigour, that, in 1623, he attracted the notice and friendfhip of feveral able mathematicians, particularly of Mr. Briggs, by whofe patronage he obtained in 1626, the profefforfhip of aftronomy in Grefham college. From this time he lived in clofe intimacy with Mr. Briggs, who entrufted to him the tafk of completing his Britifh Trigonometry, which he did not himfelf live to finifh: to this he added a preface, and the application of the logarithms to plain and fpherical trigonometry. During the time he was preparing this work for the prefs, he was cited into the high commiffion court by Dr. Laud, then bifhop of London, on account of an almanack which he had publifhed, and in which he had omitted the names of the popifh faints, and inferted thofe of fome of the martyrs celebrated in Fox's Acts and Monuments of the church. Upon trial, he was acquitted by the whole court, with the exception of archbifhop Laud only, which was made an article of accufation againft the prelate himfelf at his own trial. Mr. Gellibrand contributed fome pieces to the improvement of navigation: his fituation at Grefham college, and his intercourfe with many able mathematicians, would probably have enabled him to have rendered more important fervices to this fcience, fo important to the welfare of the country, had he not been immaturely carried off by a fever in 1636, when only in his fortieth year. He left behind him many valuable treatifes in the mixed mathematics, and was highly praifed by his contemporaries, for unwearied zeal in the inveftigation and improvement of practical fcience. It has been juftly doubted whether he had a comprehenfive mind, as he could not admit the evidence which Galileo produced in defence of the Copernican fyftem. Biog. Britan.

GELLIVARE, in *Geography*, a town of Sweden, in the lapmark of Lulea; 98 miles N. N. W. of Lulea. N. lat. 67° 7'. E. long. 20° 24'.

GELLOSIA, in *Natural Hiftory*, a name by which fome of the writers of the middle ages call the chalazias.

GELMAH, or Kalmah, in *Geography*, a town of Africa, in the country of Algiers; 50 miles E. of Conftantina. This, fays Shaw, (Travels, p. 64.) is undoubtedly the "Calama" fo much wanted in the Old geography, which was placed by St. Auftin, in an indeterminate manner, betwixt Hippo and Conftantina.

Gelmah, ancient called "Cilma," or "Oppidum Cilmanenfe," a town of Africa, in the kingdom of Tunis. This appears to have been formerly a large city, and the area of a temple is ftill remaining; 84 miles S.S.W. of Tunis. N. lat. 35° 18'. E. long. 9° 20'.

GELMON, or Gelon, or *Gilon*, in *Ancient Geography*, a city of Judah, the birth-place of Ahitophel. 2 Sam. xxiii. 34.

GELMUDEN, or Gelmuyen, or *Genemuyden*, a town of Holland, in the ftate of Overyffel, fituated on the fouth fide of the Vecht, near the Zuyder fee; 6 miles E.N.E. of Campen. N. lat. 52° 40'. E. long. 5° 57'.

GELNHAUSEN, a town of Germany, in the county of Hanau Munzenburg, on the Kintzig; given, in 1802, to the landgrave of Heffe Caffel; 12 miles E. of Hanau. N. lat. 50° 17'. E. long. 8° 15'.

GELON, in *Biography*, king of Syracufe, was defcended from an ancient family fettled in the city of Gela. He firft diftinguifhed himfelf in arms under Hippocrates tyrant of Gela, in whofe employ he defeated the Syracufans, in a battle on the banks of the Helorus. At the death of this prince he feized the fovereignty of Gela, and quickly made himfelf mafter of Syracufe by means of fome exiles. In the year 480 B. C. when Xerxes invaded Greece, the Carthaginians fent a very formidable army into Sicily, under Hamilcar, with a view of recovering all the places they had formerly poffeffed in that ifland; but while they were engaged in the fiege of Himera, they were attacked by Gelon and entirely defeated, with the deftruction as well of their fleet, which had been drawn up on the beach, as of their land army. The Carthaginians fued for peace, which Gelon granted them upon certain conditions, one of which was, that they fhould henceforth abftain from human facrifices. Gelon had hitherto governed Syracufe under the title of prætor alone, but upon this fignal fuccefs, the people with one voice hailed him as king, and paffed a decree, fettling the crown, after his death, upon his brothers Hiero and Thrafybulus. Upon his elevation to the throne, he conferred the rights of citizenfhip upon ten thoufand foreigners who had ferved under him, and he employed the remainder of his life in anxious and laudable cares to promote the profperity of his people. He died univerfally regretted about the year 478. He was a man of mild difpofition, and appears to have ruled, in general, with much lenity. The people were gratified with the confidence which he manifefted in their affections by coming to the affembly, without arms and guards, and affecting to fubmit his conduct to their free decifion. They caufed a ftatue of him to be erected in the fimple garb of a citizen, which had the fingular fate of being fpared at the time when all the other ftatues of the Syracufan kings were condemned to be melted down, at the recovery of liberty under Timoleon. Univer. Hift.

GELONI, in *Ancient Geography*, a people of Sarmatia, near the Boryfthenes, according to Pliny. Herodotus fays, that the Geloni were of Greek origin, and that having been driven from their commercial cities, they fettled in the country of the Budini. He adds, that their language was a mixture of Greek and Scythian; that they had wooden temples, like thofe of the Greeks, adorned with ftatues and altars of wood; and that every three years they celebrated feafts in honour of Bacchus. They tilled the earth, lived on corn, and cultivated gardens.

GELONUM, a town of European Sarmatia, fuppofed by Ortelius to be different from *Gelonus*.

GELONUS, a town of Sarmatia, in the country of the Budini, which, according to Herodotus, was altogether built of wood: its walls, which were high, and on each fide 30 ftadia in length, were conftructed of wood, as were alfo its houfes and temples.

GELOS, a port of Afia, in Caria.

GELOSCOPY, GELOSCOPIA, of γελως, *laughter*, and σκοπεω, *I confider*, a kind of divination, drawn from laughter; or a knowledge of any perfon's character and qualities, acquired from the confideration of his laughter.

GELSEMIUM, in *Botany*, a barbarous name, corrupted from *Gelfeminum*, which is itfelf taken from *Gelfemino*, the Italian word for jafmine. Jufs. 150. This is a genus of Juffieu, formed of the Linnæan *Bignonia fempervirens*, Willd. Sp. Pl. v. 3. 291, which he confiders as akin to his order of *Apocineæ*, and which is very probably diftinct from *Bignonia*; but we have not, any more than himfelf, fufficient materials to make out its full characters. It is figured in Catefby's Carolina, v. 1. t. 53, and is an elegant climbing fhrub, with fmooth, lanceolate, fimple *leaves*, and axillary, funnel-fhaped, yellow flowers. See BIGNONIA, n. 3.

GELT, in *Geography*, a river of England, which runs into the Irting; about a mile S.E. of Brampton, in Cumberland.

GELUDA, a town of Hindooftan, in the circar of Kotta; 40 miles E. of Kotta.

GELVES, an ifland in the Mediterranean, near the coaft of Tripoli; fo called by the Spaniards. See GERBA.

GELUS, in *Ancient Geography*, a river of Italy, in Apulia.

GELZO, in *Geography*, a fmall ifland in the North fea, near the coaft of Norway. N. lat. 69° 30'.

GEMS, a word which, in its large acceptation, denotes not only all fuch ftones as are valued for their fcarcity, weight, tranfparency, luftre, hardnefs, and confequent durability, but has been extended to feveral foft and opaque ftones, and even to fubftances not belonging to the mineral kingdom, fuch as pearls, mother-of-pearl, coral, &c.; nor has it been unufual, both in ancient and modern times, to apply it, without any epithet, to engraved ftones. (See GEMS, *Engraved*.) Pliny ufes this word fometimes in the latter fenfe, but principally in that which is conveyed by the Greek term of λιθοι τιμιοι, or *precious ftones*; but neither that celebrated cyclopædift of antiquity, nor, indeed, any of the numerous writers on this fubject, from Theophraftus to Anfelmus Boëtius, have furnifhed us with materials for afcertaining to what fpecies in the mineralogical fyftems of the prefent day feveral of thofe precious ftones are to be referred. The ancients would often apply the fame name to mineral fubftances of different nature, and ftill more frequently diftinguifh one and the fame ftone by many names, according as flight differences in colour, an additional fpot, &c. fuggefted to its owner the conveniency of introducing a new denomination. Pliny undertook to collect all thefe names, and every word that has been faid before him on the mineral fubftances to which they were applied; a tafk which he performed with more induftry than judgment and critical acumen: whence, to mention only one inftance among many, he was led to combine all that Plato had mentioned of an iron ore, called *adamas*, with his own, fufficiently fabulous, account of the true diamond, which latter happened to be known by the fame appellation. But independently of this confufion of names and ideas, both Pliny's account of gems, and that of his commentators, and of the earlier writers on this fubject, are a tiffue of fable and fuperftition; and though their ridiculous notions of the occult qualities and miraculous power with which all precious ftones are endowed, may afford momentary amufement, this is foon difturbed by the reflection that fuperftition is one of the moft odious frailties of the human mind. In juftice to Pliny's good fenfe, however, it muft be faid that he appears to have been lefs impreffed with a conviction of the truth of what he relates on the authority of others, than moft of thofe who have written on the fame fubject after him. There are, befides, fome good hints given by him to diftinguifh falfe from real gems: he points out external characters to be found by the feel, and derives others from tranfparency, weight, &c. and even fhews that the faculty poffeffed by fome precious ftones of attracting, when rubbed, fmall particles of ftraw or paper, was not altogether unknown to him.—After Pliny, from the time of St. Epiphanias, (who wrote "De XII. gemmis in Vefte Aaronis") to the beginning of the 18th century, the writers in this department of natural hiftory appear to have had no other object, next to that of extolling the virtues of gems in general, than to explain the nature of the twelve precious ftones that adorned the breaft-plate of the ephod of the Hebrew high-prieft. It is needlefs to add, that they have thrown but little light upon the fubject; and the fame may be faid of thofe who afterwards endeavoured to prove that the great medicinal effects to be derived from the internal ufe of precious ftones is by no means chimerical. Among the latter was no lefs eminent a philofopher than Boyle, who publifhed a treatife on the origin and virtues of gems, the object of which is to fhew that thofe ftones were originally in a fluid ftate, or made up of fuch fubftances as were formerly fluid; that many of their general virtues are derived from the mixture of metalline and other mineral fubftances ufually incorporated with them; while the great variety, and the particular efficacy of their virtues, arife from fome happy concurrent circumftance of their commixture, fuch as the peculiar nature of the impregnating liquor, the proportion in which it is mixed with the petrefcent juice, &c. To fupport his hypothefis of the virtues of gems, Boyle fhews, that feveral of them are not fimple concretions of any petrefcent liquors, but that they confift alfo of other mineral adventitious parts; which he argues from the feparablenefs of fuch fubftances in fome ftones, the fpecific gravity in others, and the different waters or tinctures to be met with in gems of the fame fpecies, as rubies, fapphires, garnets, and even diamonds; of which laft fome are yellow, fome of other colours. Thefe and other reafons, fpecious, no doubt, at the time they were given, would not, probably, in the prefent advanced ftate of chemical knowledge, be of fufficient force to re-introduce into practice the *Electuarium e gemmis*, *confectio de hyacinthis*, or any other of the many celebrated compofitions of this kind with which the opulent among our forefathers endeavoured to ward off the ftroke of death.

But what muft appear particularly inconfequent is, that in the very period when every thing that is great and good was afcribed to gems, the fcientific knowledge which the beft among the naturalifts and phyficians poffeffed of precious ftone was fo very flight, that the mofts heterogeneous mineral fubftances were confounded by them; and though it may have been perfectly indifferent whether a dofe of garnet, fpinel, or ruby was adminiftered to a patient, it cannot be fuppofed to have been equally fo, when in the room of lapis lazuli (ranked among the gems) blue carbonate of copper

copper was fubftituted; which, from the refults on record, and from the places where the fuppofed lapis lazuli was found, we are induced to believe did frequently happen.

At the time when mineralogy emerged from the obfcurity in which it had but too long been involved, the clafs of gems, alfo diftinguifhed by the appellations of *precious*, *hard ftones*, *pierres fines*, *nobles*, *precieufes*, *edel-fteine*, attracted of courfe the principal notice of the fyftematic writers; they were, as far as the fcientific knowledge of that period would allow it, freed of extraneous fubftances; thefe fubftances were more carefully examined, and feveral attempts made to define and arrange them. According to Baumer's definition, gems are the hardeft, heavieft, tranfparent ftones; according to that of Wallerius, they are hard, polygonal cryftals, infufible, or fufed with difficulty, particularly heavy, and of peculiar luftre. Moft of the writers of that period clafs them with the lapides vitrefcentes (to which moft of the foffils belonged that are now comprized by Werner under his flint-genus); but Linnæus, original in all his proceedings, confidering the falts as the generators of cryftallization, incorporated the different gems according to their form, as far as he was acquainted with it, among thofe falts of which they refpectively appeared to exhibit the cryftallization. Thus the diamond, becaufe it cryftallizes in the manner of alum, is called by him *alumen adamas*; after him Wallerius applies the term of *gemmæ pretiofiffimæ* to thofe precious ftones that affect the cryftal-form of alum; referring to them not only the diamond and fpinel-ruby, but alfo the fapphire and oriental amethyft which he could certainly never have feen in that form; and the term of *minus pretiofæ* to thofe that have prifmatic truncated cryftals, and are lefs hard and fplendid; and among thefe he has the emerald, beryl, topaze, and what he calls chryfolite and true hyacinth. Daubenton undertook to arrange the precious ftones according to their colour, taking the folar fpectre for a ftandard, and divided them into three claffes, *viz.* diamonds, oriental and occidental ftones. The feven principal prifmatic colours formed the genera in each clafs, while the different fhades conftituted the fpecies. This thought, when firft conceived, muft have appeared a happy one; for except in the diamond, it is the colour heightened by the luftre of the gem which principally ftrikes the beholder; but having formed his ideas chiefly from ftones cut and polifhed, that excellent man was not aware that the fapphire alone exhibits almoft all the varieties of colour obferved in other gems. The chevalier Baillou appears to have been the firft who had correct ideas refpecting the arrangement of the precious ftones; for in the profpectus of a work defcriptive of his collection, but which, unfortunately for fcience, was never publifhed, he fhews that the colour is one of the moft cafual and variable characters of thofe fubftances, and that much more conftant ones may be derived from fpecific gravity, cryftallization, and hardnefs, for determining which he mentions feveral machines of his own invention, without, however, defcribing them. His paper was printed in the Memorie della Societa Columbaria Fiorentina 1747. Romé de l'Ifle is, we fuppofe, the laft fyftematic mineralogical writer who introduces the gems or precious ftones as a particular clafs of mineral fubftances. He divides them into gems ftrictly fpeaking, and into gems of the fecond order. To the former clafs he refers, 1. The diamond. 2. The oriental ruby, fapphire, and topaze (which three latter were firft afcertained by this celebrated cryftallographer to be one and the fame fubftance differently coloured). 3. The fpinel. 4. The Brazilian ruby, fapphire and topaze (which are all three true topazes.) 5. The emerald, Siberian beryl, and Brazilian chryfolite. 6. Saxon topaze and chryfolite. 7. The chryfolite properly fpeaking (thefe are the apatite and afparagus ftone, or phofphate of lime). 8. The hyacinth (Zircon, Haüy). To the gems of the fecond order, are referred by him the garnet, tourmaline, and peridot of Ceylon (the latter is a yellowifh-green variety of tourmalin), opaque rhomboidal fchorl (fchorl and bafaltic hornblende), together with what he calls fchorl argileux, and fchorl cruciforme (chiaftolite or crofs-ftone).

Neither of the two prevalent fyftems of the prefent day confider the gems or precious ftones as a feparate clafs; that of Werner, however, not profeffing to pay great attention to their refpective conftituent parts, places almoft all of them, together with feveral others that are not diftinguifhed by the name of precious ftones, into the flint-genus, and this becaufe their more apparent characters befpeak them rather of the filiceous than any other clafs of foffils. In Hauy's fyftem they occupy different places of the firft clafs "fubftances terreufes," with the exception of the diamond and topaze, the former of which is claffed with the "fubftances combuftibles non metalliques," the latter, under the appellation of "filice fluatée alumineufe," with the "fubftances acidiferes."

Though, owing to a great diffimilarity in their characters, the ftones called *precious*, or *gems*, cannot, according to any found principles of claffification, be made to form a fub-divifion in a fyftem of oryctognofy; yet a certain affemblage of ftones, poffeffed of a fuperior weight, luftre, and hardnefs united to comparative fcarcity, remains ftill, by general confent, in the poffeffion of that title, and it would be affectation to refufe acknowledging it. Nor can fuch a diftinction, unfcientific as it may appear, be confidered as altogether ufelefs. The principal department of mineralogy is undoubtedly that which defcribes and arranges foffil fubftances in fuch a manner as to enable the ftudent to determine the name and relations of any given unknown mineral; but this is no reafon why we fhould neglect other points of view in which thofe fubftances may be confidered. Thus economical mineralogy may well be allowed to arrange its materials in a manner different from that which the fyftematic writer would choofe to adopt; and an affemblage of mineral fubftances, particularly valued as articles of ornament and luxury, may with propriety be made to form a fubdivifion in fuch an arrangement. But though fuperior hardnefs, luftre, and value are faid to conftitute the chief characters of the fubftances in queftion, it is no eafy matter to draw the line where the juft mentioned properties are fufficiently leffened to render the epithet of *precious* inapplicable. We fhall in this article confider as gems or precious ftones all thofe apparently filiceous fubftances that, with more or lefs tranfparency, have greater hardnefs than quartz, and the fpecific gravity of which is above 3. Their fucceffion is as follows: diamond, fapphire and oriental ruby, chryfoberyl, fpinel, hyacinth and jargon, emerald and beryl, topaze, garnet, chryfoprafe, opal, vefuvian, and chryfolite. The two laft are precious ftones by courtefy only. The hardnefs of chryfolite is fcarcely that of quartz. As to the opal, though the abfence of two of the above characters would exclude it from this affemblage; yet it is by common confent pronounced a firft rate gem, often equal in value to a diamond of the fame fize, and muft therefore remain with the precious ftones.

Diamond.—Of this moft precious of all the gems a fufficiently detailed account has been given under that word, to which we refer, but add in this place fome remarks more particularly connected with the fubject of this article.

It is well known that brown, brownifh-yellow, and other fpots

ſpots conſiderably leſſen the value of diamonds, and that perſons concerned in their ſale endeavour to free them from theſe defects by expoſure to a certain degree of heat. This is ſometimes effected in ſmall porcelain crucibles, ſometimes by ſubjecting the diamond to the heat of the blow-pipe, in which latter caſe borax is added to prevent their acquiring a fine cruſt, which takes away the luſtre. In theſe operations care ſhould be taken that the heat be applied by ſlow degrees, and as gradually diſcontinued; ſince, in the contrary caſe, if the ſtone ſhould happen to have any incipient flaws or feathers, theſe will generally be found conſiderably to increaſe. This proceſs, however, has not conſtantly the deſired effect; for ſometimes the ſpecks will encreaſe in ſize, or exchange their colour for one perhaps ſtill leſs deſirable. Sometimes a browniſh colour is converted into red by the action of fire. Bruckmann ſaw a diamond, with a large brown ſpot before the blow-pipe in borax, aſſume a beautiful and equally diffuſed red, like that of the balias ruby, and it was ſold with great profit as a red diamond. Another, however, with a ſpeck apparently of the ſame kind, when expoſed to the flame of the blow-pipe, became blackiſh throughout, by which change of colour its value was of courſe conſiderably diminiſhed. As to the choice of rough diamonds, (we tranſcribe what Mr. Allen has ſaid on this ſubject in a paper inſerted in the Philoſophical Magazine,) great care ſhould be taken in regard to their colour, their being free from extraneous matter, and their ſhape. The moſt perfect are cryſtalline and reſembling a drop of clear ſpring water, in the middle of which you will perceive a ſtrong light playing with a great deal of ſpirit. If the coat be ſmooth and bright, with a little tincture of green in it, it is not the worſe, and ſeldom proves bad; but if there be a mixture of yellow with green, then beware of it; it is a ſoft greaſy ſtone, and will prove bad.

If a ſtone has a rough coat that you can hardly ſee through it, and the coat be white, and look as if it was rough by art, and clear of flaws or veins, and no blueiſh caſt in the body of the ſtone, which may be diſcovered by holding it againſt the light, the ſtone will prove good.

It often happens that a ſtone ſhall appear of a reddiſh hue on the outward coat, not unlike the colour of ruſty iron, yet, by looking through it againſt the light, you may obſerve the heart of the ſtone to be white; and if there be any black ſpots, or flaws or veins in it, which by a true eye may be diſcovered, although the coat of the ſtone be opaque, ſuch ſtones are generally good.

If a diamond appear of a greeniſh bright coat, reſembling a piece of green glaſs inclining to black, it generally proves hard and ſeldom bad; ſuch ſtones have been known to be of the firſt water, but if any tincture of yellow ſeems to run within it you may depend upon its being a bad ſtone.

All ſtones of a milky coat, whether the coat be bright or dull, if ever ſo little inclining to the blueiſh caſt, are naturally ſoft, and in danger of being flawed in the cutting; and though they ſhould have the good fortune to eſcape, yet they will prove dead and milky. All diamonds of a cinnamon-coloured coat are very dubious: but if of a bright mixed with a little green, then they are certainly bad, and are accounted amongſt the worſt of colours.

The greateſt care muſt be taken to avoid beamy ſtones; and this requires greater ſkill and practice than many jewellers are equal to. By beamy ſtones are meant ſuch as look fair to the eye, and yet are ſo full of veins to the centre, that no art or labour can poliſh them; they run through ſeveral parts of the ſtone, and ſometimes through all: when they appear on the outſide, they ſhow themſelves like protuberant excreſcences, from whence run innumerable ſmall veins, obliquely croſſing each other, and ſhooting into the body of the ſtone: the ſtone itſelf will appear a very bright coat and ſhining, and the veins looking like a very ſmall poliſhed ſteel needle; ſometimes the knot of the veins will be in the centre, and fibres ſhoot outward, and the ſmall end terminate in the coat of the diamond. Stones having theſe properties are difficultly cut, and will never take a good poliſh.

Some ſyſtematic writers have given the name of *red diamond* to the ſpinel-ruby, probably on account of ſimilarity in their cryſtallization. The ſmall cryſtallized ſparkling varieties of pure rock cryſtal are frequently dignified with the name of *diamond;* thus, we have Briſtol, Corniſh, Bohemian, Tartarian, Hungarian, Sileſian, Canadian, Aſturian diamonds, diamond of Baffa, of Alençon, Dauphiny, &c.

Sapphire.—The gem next in hardneſs to the diamond is the ſapphire, compriſing, as varieties, all thoſe precious ſtones that are known by the name of oriental gems: namely, the oriental ruby, the oriental topaze, the oriental emerald. All theſe, taken together, form a ſub-diviſion of that aſſemblage of hard ſtones denominated *corundum;* which barbarous name might have been conveniently exchanged for one better adapted to European ears. The propriety of uniting the adamantine ſpar and corundum with the ſapphires, firſt occurred to Romé de l'Iſle, and his idea was afterwards followed up, with much acuteneſs of obſervation, by count Bournon, who divides the corundum, according to the two different ſtates in which it exhibits itſelf, into *perfect* and *imperfect* corundum: the former of them, conſiſting of all the above mentioned precious ſtones, was before called by Haüy *telſie* (*i. e.* perfect body); but having followed M. de Bournon in uniting the common corundum and diamond ſpar with his telſie, that mineralogiſt now diſtinguiſhes this latter by the name of *corindon hyalin.*

In general the name of ſapphire is given to the blue variety, which is either of a deep indigo blue, (now and then called the *male ſapphire* by lapidaries,) or of various lighter tints, ſeveral of which are ſometimes to be ſeen in one and the ſame cryſtal: the paleſt are ſometimes called *female*, or *water ſapphires*, which latter denomination is alſo applied to a blue variety of quartz. The ſapphire, more frequently than the red variety, or ruby, gradually paſſes into perfectly white or colourleſs, which, when cut, may almoſt paſs for a diamond.

A good ſapphire of ten carats is valued at 50 guineas. If it weigh twenty carats, its value is 200 guineas; but under ten carats, it may be valued by multiplying the carat at 10 ſhillings and ſixpence into the ſquare of its weight.

The red variety of ſapphire is called *oriental ruby.* Its colour is generally between a vivid cochineal and crimſon red; the latter, by an admixture of a portion of blue paſſing into violet, when it obtains the name of *oriental amethyſt;* which, without conſulting other characters, is immediately known from amethyſt quartz by its ſuperior luſtre.

A perfect ruby, above $3\frac{1}{2}$ carats, is more valuable than a diamond of the ſame weight. If it weighs one carat it is worth 10 guineas; two carats, 40 guineas; three carats, 150 guineas; ſix carats, above 1000 guineas. A deep coloured ruby, exceeding twenty carats weight, is generally called carbuncle. Of theſe 108 are ſaid to be in the throne of the great mogul, from 100 to 200 carats each.

Sapphire alſo occurs of a yellow colour, and is known as ſuch by the name of the *oriental topaze.* Its tint is generally between the dark yellow of the Brazilian, and the pale yellow of the Saxon topaze. An admixture of blue to this colour

 produces

produces the ſcarce green variety of ſapphire, called the *oriental emerald.*

Specimens, exhibiting ſeveral of theſe colours, are highly valued, both on account of their ſcarcity, and as inconteſtable proofs that difference of colour alone is not ſufficient to ſeparate ſubſtances ſo perfectly ſimilar in all other reſpects.

Beſides theſe different colours, two other properties, with reſpect to light, are obſervable in the ſapphire, which, though they proceed from an imperfection in the ſtructure of the cryſtal, are, nevertheleſs, much eſteemed. The firſt is that particular reflection obſerved in mother-of-pearl, called *chatoyement.* The other is that kind of reflection which produces the appearance of a bright ſtar with ſix rays, and which has procured the ſapphires that poſſeſs it the names of *aſterias* and *ſtar-ſtone*, and, among French lapidaries, that of *ſaphir de chat.* This beautiful variety is more frequent in the blue ſapphires than in the others. It is never ſeen in perfectly tranſparent ſtones, but is alſo obſervable in ſome of the leſs opaque cryſtals of common corundum.

The principal regular cryſtalline forms of all the ſapphires are the perfect ſix-ſided priſm, and the more or leſs acute-angled double and ſingle ſix-ſided pyramid, often deeply truncated and otherwiſe modified: they are all derived from a ſlightly acute rhomboid, which is the original or primitive cryſtal of this ſubſtance. But the rough ſapphires of commerce are generally rounded pieces, owing their form to rolling in the water, &c. In hardneſs the different varieties of ſapphire yield only to the diamond; the blue variety is ſuperior, in this reſpect, to the red, or the oriental ruby. The ſpecific gravity of blue ſapphire is from 3.907 to 4.161; that of the ruby from 3.933 to 4.087, according to Bournon.

Sapphires are found in the ſand of the rivers, at the foot of granite and trapp-rocks, particularly in Ceylon and Pegu; and they are likewiſe met with in the rivulet Rioupezouliou, at Expailly, in France. They are accompanied in Ceylon by ſpinel-ruby, tourmalin, ceylanite, and zircon. At Expailly, where they occur with iron ſand and ſmall fragments of hyacinth, they are gathered at the time when the rivulet happens to be nearly dry. The men employed in this kind of fiſhery, furniſhed with a kind of ſmall tray, with a linen bag, go up the bed of the rivulet till they arrive at ſmall depreſſions where the water has remained ſtationary: they enter them and fill their trays with the ſand of the bottom; this they waſh and ſtir with their hands under water, by which the lighter particles are carried off, while the fragments of ſapphire, &c. remain.

The ſapphires (alſo by way of excellence called *oriental gems*) claim the firſt rank after the diamond, and indeed the colourleſs variety may be conſidered as the beſt ſubſtitute for the latter. Lapidaries will often expoſe the light blue variety to the action of the fire in order to render them white and more brilliant. Brongniard obſerves, however, that the ſapphires from Expailly, inſtead of becoming colourleſs in the fire, acquire a greater intenſity of colour. Mr. Brard was aſſured by M. Picherot, a lapidary, that having left an Indian ſapphire for too great a ſpace of time expoſed to the fire, he was ſurpriſed by finding it melted into a convex ſtone (*en cabochon*) with even ſurface, though it had been cut with facets before the operation. Theſe ſtones are cut in Europe with the diamond-powder, and poliſhed with emery, a variety of the common corundum.

With regard to the above-mentioned variety, called *ſtar-ſtone*, we find it obſerved by count Bournon, that the manner of cutting it to exhibit this kind of reflection is generally, on the part of the lapidary, the reſult of chance; hence, in the greater number of the ſtones that have this property, the point from whence the ſtarry reflection proceeds, inſtead of being in the middle of the ſtone, is obſerved to be ſituated in a part more or leſs near to its baſe, by which the beauty of the ſtar-ſtone is conſiderably diminiſhed. The ſame author adds, that when an oriental ruby, or a ſapphire, which has the qualities neceſſary for the purpoſe, is intended by the lapidary to be formed into a ſtar-ſtone, he ought to make his ſection paſs below that part of the ſtone which he has found to correſpond with the ſummit of the primitive rhomboid; and as the kind of cutting moſt proper to produce this effect, is that *en cabochon* with as high an ellipſis as poſſible, the lapidary ought, at the ſame time, to take great care that the ſummit of this ellipſis be ſituated exactly under the point which correſponds with the ſummit of the rhomboid.

One of the moſt beautiful blue ſapphires is that preſerved in the collection of the Muſeum of Natural Hiſtory at Paris: it has the form of an oblique angular parallelopipedum; its weight is 132½ carats. Haüy thinks it had been cut and poliſhed; but Patrin is of the contrary opinion, becauſe no lapidary would have ever taken it into his head to give to a precious ſtone of ſuch value, a form ſo unuſual and ſo ungrateful in its effect upon the eye as the rhomboidal form. It is probable that this beautiful ſtone was really a primitive cryſtal of ſapphire, the ſides of which were afterwards poliſhed by art.

Formerly it was the cuſtom with ſome lapidaries to place the blue part of a peacock's feather under blue ſapphires, inſtead of common foil.

The ſapphire of moſt of the ancient writers appears to have been the lapis lazuli.

What is commonly called *water ſapphire*, or *falſe ſapphire*, is a blue variety of quartz; the *Brazilian ſapphire* of lapidaries is ſometimes a variety of topaze or beryl, ſometimes a blueiſh-green variety of tourmaline; and blue fluor-ſpar is now and then mentioned under the name of falſe ſapphire.

The accounts of ſmall blue and red ſapphires having been melted into beautiful large ones, by means of phoſphoric acid, &c. appear to be altogether fabulous.

Chryſoberyl.—*Chryſoberyl* of Werner, *Cymophane* of Haüy, is the ſame with the *opaleſcent*, or *oriental chryſolite* of lapidaries; a precious ſtone, nearly as hard as ſapphire, and harder than topaze. Its ſpecific gravity is from 3.600 to 3.720. Its principal colour is aſparagus green; but it is only valued by the lapidary when exhibiting that kind of opaleſcence which repreſents a ſmall blueiſh-white light, undulating, as it were, in the interior of the ſtone, and changing its ſituation according to the poſition in which it preſents itſelf to the eye. There are alſo opaleſcent chryſolites, in which this kind of luſtre expands over great part of the ſurface of the ſtone, without ſhewing ſcarcely any locomotion. See CHRYSOBERYL.

This ſtone, which is alſo ſometimes called *gold-beryl*, is not frequently ſeen as an article of jewellery. Its *chatoyement* is ſometimes like that of the adularia and cats-eye; but from either of theſe ſubſtances it is eaſily diſtinguiſhed by its ſuperior hardneſs. It appears to have been confounded with the yellowiſh green beryl by thoſe writers who mention Siberia as one of the native places of this ſubſtance.

Spinelle.—The ſpinelle, both of the German and French mineralogiſts, is that precious ſtone to which the name of ruby more particularly applies: it is the ruby-ſpinel and ballas ruby of the lapidaries and jewellers. It ſcratches quartz with eaſe, but is itſelf ſcratched by ſapphire. Specific gravity about 3.7. It colour is principally red, carmine, crimſon and cherry red; from carmine it paſſes through roſe

rose into reddish-white, and from cherry and crimson-red into blueish-red and purple. The two last of these varieties were formerly called almandine, a name now given by Karsten and others to the noble garnet and pyrope. The crystal form of the spinel, as we see it in commerce, is generally that of more or less regular octahedra and rounded pieces. For a fuller account, see SPINELLE.

It is found in Ceylon and Pegu, in the sand of rivers, accompanied with zircon, hyacinth, &c. Though it is inferior in lustre and richness of colour to the oriental ruby, or red sapphire, yet when of a certain size, it is much esteemed as a gem. We are told that when the weight of a spinel exceeds four carats (sixteen grains) it is valued at half the price of a diamond of the same weight. Mr. Brard has seen one at Paris of 215 grains.

It is extremely difficult, or, perhaps, impossible, to settle the synonomy of the spinel and the oriental ruby; and, indeed, some varieties of either of these substances are so very like one another, with regard to external characters, that, where the crystallization cannot be observed, the best connoisseurs are frequently at a loss to distinguish them. The substances most commonly confounded with it are, the pyrope and noble garnet (*Barbary ruby; rubino di rocca* of the Italians); and the red topaze, which has obtained the name of *Brazilian ruby*, and is frequently called ballas ruby. Ignorance has also given the name of ruby to red fluor spar, and to red quartz; and it is probable that to the latter are to be referred the twelve pale rubies mentioned in Volkman's Journey through Italy, as having been presented to the city of Venice, by the emperor John Cantacuzenus, in 1343, and each of which is said to be of the weight of seven ounces.

Hyacinth and *Jargon* (*Zircon* of mineralogists). The Wernerian system distinguishes hyacinth and jargon as species of the same genus; Haüy considers them as varieties of one and the same species: these great mineralogists consequently keep both substances close together. Their hardness is not much greater than that of the emerald; but their specific gravity generally exceeds 4.4. The secondary form in which it usually occurs is the four-sided prism, shorter or longer, terminated by four planes of acumination set on the lateral planes; or, in consequence of a truncation of the solid angles of the base of the primitive octahedron, on the lateral edges (See ZIRCON.) In commerce it is generally seen in irregularly rounded pieces.

The principal colour of the hyacinth, strictly speaking, is that particular yellowish-red, well known by the name of hyacinth red, which passes on one side into orange-yellow, on the other into reddish-brown. Many are the substances that have been confounded with it: the *oriental hyacinth* is the orange-coloured sapphire; the *occidental* is a deep coloured, and the *hyacinthe miellée*, a honey-coloured variety of topaze; the *hyacinthe la belle*, and the *hyacinth of Dissentis*, are deep orange-coloured varieties of the noble and common garnet; the *volcanic hyacinth* is the Vesuvian or Idocrase. Most of these substances are generally superior in brilliancy and value to the real hyacinth, which is the less esteemed, as it seldom occurs of a moderate size without being impure and faulty.

The name of *jargon*, a corruption of zircon, is generally given to those varieties of hyacinth which are nearly colourless, greenish, blueish-grey, and also brownish-red. The first of these are most esteemed; whence art imitates them by exposing light-coloured varieties to the action of fire, which renders them colourless. In this state (whether produced by art or nature) they are improperly called *diamans bruts* by French jewellers, and often sold for real diamonds of inferior quality. But as very small brilliants, it is often difficult to distinguish the best sort from real diamonds; whence they are frequently employed for ornamenting watch-cases, &c. The other varieties are not so much esteemed. Emmerling says they are principally used as an ornament in mourning dress.

The hyacinth and jargons are brought from Ceylon, and other parts of India. Hyacinths in small crystals and fragments, some of them fit to be cut, are also found in the rivulet Rioupezouliou, in Italy, &c. but those of Spain, described by Bowles and others, are nothing but quartz crystals, vulgarly called in Spanish *jacintos de Compostella*.

Topaze.—This gem, to distinguish it from the yellow variety of sapphire, is sometimes called *occidental tapaze*; though this name is also given to a variety of rock crystal. It is inferior to spinelle in hardness, but it is harder than emerald. Born states its hardness compared with that of the diamond, to be as seven to one. Its specific gravity is 3.5.

It occurs colourless, like pure rock crystal, yellow, red, and blue. Among the colourless variety, the Siberian appears to be the best; but it is also found of very fine lustre in the Brazils and in New Holland, where it has been lately discovered occurring chiefly as rolled pieces.

The yellow is the usual and characteristic colour of this stone; it occurs as pale wine and straw colour in the Saxon topazes; it is sometimes so very faint, that the crystals appear almost colourless. In the Brazilian yellow variety, it is generally of a deep wine colour, which passes through orange mixed with red into a pretty pure flesh red. This red colour or pink is said to be often artificially produced by heating the crystals to a certain degree, and it is supposed that the gems sold for *Brazil rubies* are nothing but topazes, thus altered by heat. They go also by the name of *rubicelle* or *rubacelle*, but not by that of *rubasse*, which is common rock crystal, heated and coloured red by the absorption of a red solution.

The white Brazilian topazes have often a tinge of blue, which is sometimes sufficiently intense to procure it the appellation of *oriental aquamarine*; in the same manner as the Saxon topaze, when shewing a faint admixture of green, is sometimes called *Saxon* or *occidental chrysolite*. It is now and then seen of a pale lilac blue, but frequently what is exhibited as topaze of this colour, turns out to be nothing but a very pure variety of amethyst-quartz.

The cross fracture of all varieties of topazes is perfectly straight foliated.

The secondary crystalline forms, more frequently occurring among the topazes of commerce, are four, eight, and six-sided oblique prisms, generally with longitudinal streaks, and especially in the Brazilian, terminated by a low four-sided pyramid, which is now and then deeply truncated. The white Siberian topaze is often found in very large crystals, which are, however, in general less pure than the middle-sized and small ones: when heated they give signs of electricity.

The Brazil topazes are said to be found imbedded in clay; but they are brought to Europe in detached crystals, generally acuminated on both extremities, one of which, when heated, exhibits positive, the other negative electricity. The Saxon topaze, which is mostly seen in crystals broken on one extremity, or still attached to its matrix, which is generally a particular rock called topaze-rock, becomes electric by friction. For a more complete description, see TOPAZE.

The topazes are not sufficiently scarce to be much valued by the jeweller and lapidary; the deep yellow variety from the Brazils is in general preferred to the pale sort, though the latter is often superior to the former, both in fire and hardness. From Hawkesworth's account of Cook's first voyage,

voyage, we fee that there were at that time three forts, of different value, fold at Rio de Janeiro, and diftinguifhed by the names of *Pinga d'Agua qualidade primeira, Pinga d'Agua qualidade fegunda*, and *criftallos amarellos:* they were then fold, large and fmall, good and bad together, by octavos or eighth parts of an ounce, the beft at 4*s.* 9*d.* The *Pinga d'Agua* are probably the white ones, a fine fort of which is now called *da mina nova*.

The above-mentioned topaze rock, of Schneckenftein, is a mixture of quartz, fhorl, topaze, and lithomarge, and its powder is ufed for polifhing the topazes it contains. Another mode of polifhing the Saxon topaze, as mentioned by Mr. Kern, is that on a difk of copper, by means of tripoli, with the addition of fpirits of wine.

The name of this gem is faid to be derived from that of an ifland in the Red fea, where the topaze was firft difcovered by the Greeks. The topaze of the ancients, however, does not appear to have been the fame with our's: it is defcribed as of a green colour, and feems to anfwer to the chryfolite of the prefent day.

Subftances, to which the name of topaze is improperly applied, are the *oriental topaze*, which is the yellow fapphire; the *Bohemian topaze*, fometimes called *occidental topaze*, is a yellow, and the *fmoaky topaze*, a blackifh variety of rock cryftal, called alfo cairn-gorum. The yellow variety of Siberian beryl is likewife improperly diftinguifhed by the name of *topaze*, as is a variety of hyacinth or zircon, and of olivine; the yellow variety of fluor-fpar is called *falfe topaze*.

Emerald and Beryl.—Thefe two are fo nearly allied both in external and other characters, that moft fyftematic mineralogical writers have thought proper to unite them as varieties or fub-fpecies of one and the fame fpecies. Karften calls the former *fmooth*, the latter *ftriated emerald*. Their hardnefs is rather greater than that of quartz, which they fcratch with difficulty. Specific gravity 2.7. See EMERALD.

In common life that variety only is denominated *emerald*, which exhibits the beautiful pure prifmatic green, without any apparent predominance of either yellow or blue. Of that intenfe colour it has only been found in Peru, where it occurs in the valley of Tunia or Tomana, near New Carthagena, between the mountains of Granada and Popayan. Such emeralds are alfo brought to Europe from many parts of the Peruvian coaft, from point St. Helena, up to the bay Bonaventura. The largeft emerald on record is that defcribed by Garcilaffo de la Vega, as having been of the fize of an oftrich's egg; it was in the poffeffion of the inhabitants of the valley of Manta in Peru, where, when the Spaniards arrived, it was worfhipped under the name of the goddefs or *mother* of emeralds; and the fmall ones that were brought as offerings, the priefts diftinguifhed by the name of the *daughters*.

The large emerald, of the weight of twenty-eight pounds and three quarters, at Reichenau, a monaftery on an ifland of the lake of Coftanz, is ftated to be *green fluor* by Mr. Coxe, on whofe authority, fince the treafure is no longer exhibited, every writer on this fubject pronounces it to be fluate of lime. But long before that gentleman, Mr. Von Beroldingen had examined the fubftance, and found it to be *glafs*. Which of the two travellers is in the right? If it be the latter, it would appear that Mr. Coxe has been mifled by the German word *fluſs*, which is generally applied to fluor, but likewife denotes flux, in the fenfe in which enamellers ufe it.

Mr. Bufching afferts, that the emerald caufes much labour to the lapidary to cut it; but this appears to be contrary to experience, and we know that the emerald is one of the fofteft of the precious ftones. It is generally cut in thick tables with fmall facets furrounding the border. Emeralds of the firft quality require no foil, but are, like diamonds, placed on a black ground; thofe of inferior luftre receive a green gold foil, in the room of which a gloffy green fattin was now and then fubftituted in former times.

What the ancients meant by *fmaragdus*, is a queftion which has engaged the attention of a great number of antiquaries, and many opinions have been formed, of which the moft plaufible is, that the Greeks and Romans dignified by that name all fine ftones of a green colour both tranfparent and opaque. The emerald of the prefent day may have been among the fubftances called fmaragdus; and, indeed, the defcription given by Pliny of that of Scythia, Bactria, and Æthiopia, agrees very well with it. If fo, it is clear that the green emerald, which we fuppofe confined to Peru, has formerly been found alfo in the old world.

The precious ftone, called *oriental emerald*, is the green and fcarce variety of fapphire; the *Brazil emerald* is a green tourmalin; the *Carthagena emeralds* are nothing but green fluor fpar, as are thofe (according to Haüy) called *emeraudes morillons* and *nègres-cartes*; of the two latter, however, Patrin obferves that they are real American emeralds, but of inferior quality.

The *beryl*, alfo vulgarly known by the name of *aquamarin* (more vulgarly *egg* or *eagle-marin*), is generally ranked among the gems: its cryftals are of a more obvioufly lamellar ftructure, much larger than the green emeralds, and though their blue colour often paffes into green, this is never of a vivid kind, but generally oil and mountain-green and greenifh-yellow. (See EMERALD, *Beryl.*) When of honey or wine-yellow, the beryl is called *honey-emerald*, or *emeraude miellée*.

A greenifh variety of quartz, the apatite, and cyanite, are fometimes confounded with beryl; and the London lapidaries give this name to fine pellucid carnelians. (See GEMS, *Engraved.*)

There feems to be no doubt that our beryl is the fame with fome of the ftones thus named by the ancients.

Beryls are cut with emery on a leaden difk, and polifhed on a pewter difk with tripoli.

The deep greenifh aquamarins are fet with a fteel-coloured or greenifh-blue foil; the pale ones are either placed, like the diamond, on a black ground, or, what has a better effect, on a filvery foil.

Garnet.—Blood and cherry-red, blueifh-red, yellowifh and hyacinth red. Hardnefs greater than that of quartz. Spec. grav. 3.4—4.3.—Werner, and fome other modern mineralogifts, have feparated from the noble garnet, the Bohemian or that variety which is found only in rounded pieces, calling it *pyrope*; and Karften has given the name of *almandine* to that variety which is often called *oriental* or *Sorian garnet*. If fubdivifions of a mineral fubftance are required, thofe that make them fhould be cautious in applying to them ancient vague denominations, or names already given in common life to fubftances different from thofe that are to be thus diftinguifhed. Neither of the juft-mentioned writers is able to prove, or even to render it probable, that the ancients underftood by thofe appellations the precious garnet; *pyropus*, *carbunculus*, *carbo*, *anthrax*, were, with them, names for all forts of red ftones endowed with a certain degree of luftre, but principally for the pure red fapphire and fpinelle; and, on the other hand, the names both of pyrope and almandine are fometimes given by modern lapidaries to the blueifh-red variety of fapphire, called alfo the oriental amethyft.

The only diftinction made by jewellers, with regard to garnets, is that they call *oriental* thofe of a richer deep blood red, whatever be the part of the world from which they come,

come, and *Syrian* (meant for *ſorian* or *ſirien*), thoſe that ſhew an admixture of blue; though this latter name is given by Boetius to a yellowiſh-red variety. Garnets, in which the yellow predominates, are by the Italians called *jacinto guarnacino*, to which alſo the *iacinthe la belle* appears to belong.

Even the fineſt of the noble garnets have a ſombre appearance if compared with the ruby, whence lapidaries, to remedy this defect in ſome meaſure, will often cut the ſtones with a conſiderable concavity on one ſide; in which ſtate they are called *garnet cups*.

The deep red variety of the noble garnet, from Greenland, which occurs only maſſive, in curved lamellar concretions, appears to be worthy to be employed for ornamental purpoſes.

Chryſopras.—This ſemi-tranſparent ſtone, of a beautifully apple-green paſſing into graſs-green, deſerves to be ranked with the gems or precious ſtones, as well on account of its hardneſs, which far exceeds that of quartz, its ſpecific gravity, which is 3.25, and on account of its value as an article of jewellery, in all which reſpects it ſurpaſſes the true varieties of quartz, to which ſpecies it is referred by the French ſchool under the name of *praſe*: but Werner's praſe is a dark-green variety of true quartz. It is much eſteemed as a gem; a ring ſtone of the pure uniformly apple-coloured, nearly tranſparent variety, that ſhews no paler ſpots, has often been ſold for twenty guineas and upwards.

The oxyd to which the Sileſian chryſopraſe owes its pleaſing colour, is that of nickel; we ſhould therefore ſuppoſe it to be permanent; but the fact is, that the colour of chryſopraſe is very changeable; it is altered both by being expoſed to moiſture and to heat. Lapidaries even pretend that great care ſhould be taken in poliſhing it; for if, for want of ſufficient moiſture, or by the too rapid motion of the wheel, it be over-heated in the act of poliſhing it, it is ſaid to become whitiſh or turbid. Bruckmann placed a poliſhed, but not perfectly pure, chryſopraſe on the heated ſtove in his room, and after ſome weeks found it quite opaque, of a dirty dark-green colour, and full of black flaws.

Jewellers formerly uſed to place a gold foil under the more tranſparent Sileſian chryſopraſes.

Its comparatively high price has produced excellent imitations in paſte; but they are eaſily known by their inferior hardneſs and greater ſpecific gravity, the metallic oxyd with which the glaſs is coloured being probably lead.

The *Opal*, or *noble opal*, to diſtinguiſh it from the common and ſemi-opal that have no vivid colours, is a very brittle ſtone, and its ſpecific gravity ſeldom exceeds 2; but the beautiful play of colours ariſing out of theſe very imperfections, the brilliant blue, green, red, and yellow-coloured ſpots, variouſly mixed and modified, have, notwithſtanding its inferior hardneſs, procured it a diſtinguiſhed place among the gems. In modern times fine opals of moderate bulk have been frequently ſold at the price of diamonds of the ſame ſize; the Turks are uncommonly partial to it; but the eſtimation in which it was held by the ancients (who alſo called it *pæderos*, or child beautiful as love), ſurpaſſes belief; indeed, Nonius, the Roman ſenator, preferred baniſhment to parting with his favorite opal which was coveted by Marc Antony. But it is very probable that many of the ſtones deſcribed by ancient and modern writers as beautiful opals of great hardneſs were opaleſcent ſapphires. In modern times, too, many fine glaſs paſtes have been ſold at enormous prices for *oriental opals*; for this is the name given to the moſt brilliant varieties, though none of them are known to be found out of Europe, the moſt brilliant coming from Hungary. The lapidaries, who generally cut the opal ſimply *en cabochon*, which form is the moſt advantageous for its play of colours, diſtinguiſh ſeveral varieties of this ſtone, ſome of them belonging to the ſub-ſpecies, called common and ſemi-opal by Werner. That in which the colours appear as ſpecks or ſpangles, the French jewellers call *opale à paillettes*, that with flakes, or lengthened ſpots, is known by the name of *opale à flammes*: they farther diſtinguiſh the *yellow opal*, which is eſteemed only when it is of a brilliant gold yellow; the *blackiſh opal*, with faint, particularly reddiſh or violet colours, appearing ſometimes in the manner of burning nearly extinguiſhed charcoal; the *wine-opal*, in which, when held between the eye and the light, the yellowiſh-red predominates; if it appear quite red when viewed in this poſition, it is called *giraſol*, which name is alſo given to the corundum-ſtar ſtone; the *milk-opal*, milky white, ſometimes but imperfectly tranſparent, appearing blueiſh and reddiſh blue when held againſt the light, and offering here and there ſmall ſpecks of green and purple. The matrix of the opal, a dark grey diſintegrated porphyry, with brilliant particles of opal diſſeminated, is likewiſe ſeen cut into ring ſtones, &c. If this porphyritic ſubſtance is found to be perfectly black, (in which caſe the diſſeminated noble opal appears to ſtill greater advantage,) the black colour is in general artificially produced by ſoaking the ſtone in oil, and ſubjecting it to the action of the fire; the carbonaceous matter thus produced remains in the pores of the matrix, while the diſſeminated grains of opal, provided the heat had not been too intenſe, retain their original brilliancy.

The variety of ſemi-opal, called *oculus mundi*, or *hydrophane* (becauſe it becomes tranſparent and often even irideſcent when immerſed in water, but returns to its original ſtate of opacity as ſoon as the abſorbed moiſture is again evaporated), is ſometimes ſet in rings *au jour*, and the rate at which even the ſmalleſt of theſe ſtones were formerly ſold is truly ridiculous; at preſent their price is conſiderably lowered, though they ſtill continue to be objects of curioſity. It is found in Hungary, Iceland, and Hubertſburgh, &c.: many that come from the two laſt mentioned places acquire both tranſparency and irideſcence by imbibing water. See HYDROPHANE.

Two or three other ſubſtances that rank by courteſy among the gems, but are ſcarcely of the ſame hardneſs with quartz, are the Veſuvian (idocraſe of the French ſchool), and the chryſolite and olivine, united by Haüy under the name of peridot.

Veſuvian, (*idocraſe* of Haüy,) known alſo by the name of *hyacinthine*, or *brown volcanic hyacinth*, is ſufficiently hard to ſcratch quartz; its ſpecific gravity is about 3.4; it is ſenſibly double-refracting; its colour is generally reddiſh-brown, often approaching to hyacinth red, but likewiſe olive-green of various depth and even blackiſh-green. Its fracture is vitreous, uneven: the primitive form of its cryſtals, which have a poliſhed ſhining ſurface, is a very ſhort priſm with ſquare baſe; the ſecondary cryſtals are formed by the truncation of all the edges. (See VESUVIAN.) It is often difficult to diſtinguiſh it in its natural ſtate from common garnet; Sauſſure, deſcribing a yellowiſh-red variety of the latter found at Diſſentis, was miſled to conſider it as the ſame with Veſuvian. Its ſpecific gravity and hardneſs are inferior to thoſe of garnet. It is often very difficult to diſtinguiſh it from chryſolite when cut and poliſhed: for both agree in ſpecific gravity and double refraction, ſo that no diſtinctive character remains except a ſlight difference in colour, which is generally of a lighter olive-green in the chryſolite than in the Veſuvian, and in the latter is commonly obſcured by an admixture of black.

black. From the Braſilian tourmaline it is eaſily diſtinguiſhed by not being electric except by friction, while the tourmaline becomes electric by heat.

The more tranſparent varieties of the Veſuvian or idocraſe are cut and poliſhed by the Neapolitan lapidaries, who ſell them to travellers as objects of curioſity, under the name of *Veſuvian gems;* but they are of little value and ſeldom employed as articles of jewellery. Dr. Bonvoiſin has lately deſcribed a beautiful variety of this ſubſtance, under the name of *peridot-idocraſe:* it is found in the ſerpentine rock Teſta-Ciarva, in Piedmont, in cryſtals of a delicate green colour, paſſing ſometimes into yellowiſh-red, or wine colour.

Chryſolite, or Peridot.—Its uſual colour is a high piſtachio-green, approaching ſometimes to olive-green, more rarely to graſs-green: it is alſo found paſſing into reddiſh-clove brown, but this variety is no object of jewellery. The general form of its cryſtals is that of a flattened priſm of from four to eight lateral planes, with a pyramidal or cuneiform ſummit, which is often truncated. It has conſiderable double refraction. Its geognoſtic ſituation is not well known, nor even the country from which it comes: that which is more particularly an article of commerce is brought to Europe from the Levant.

The colours of the chryſolite, though not vivid, are chaſte and pleaſing; but the hardneſs of this ſtone is ſo inconſiderable that it ſoon becomes dull and unſightly when uſed for ornament; hence it has never been much valued, for, indeed, according to a ſaying among French lapidaries,

> "Qui a deux péridots
> En a un de trop."

What is not eſteemed is generally neglected, and conſequently confounded with other things it may reſemble: thus the chryſolite (which name was probably given by the ancients to our topaze), has been jumbled together with the following ſubſtances, ſome of them more, others leſs precious than itſelf: 1. *Chryſoberil,* either ſimply or with the epithets of *oriental* and *opaleſcent;* 2. Light-green *zircon,* from Ceylon; 3. Yellowiſh-green *topaze,* from Saxony; 4. Yellowiſh-green *beryl,* from Siberia; 5. Piſtachio-green *tourmaline,* from Braſil; 6. *Prehnite,* from the Cape; 7. Tranſparent yellowiſh-green *garnet,* from Saxony; 8. Light-green var. of *Veſuvian,* (idocraſe, Haüy); 9. *Augite,* (pyroxène, Haüy); 10. Olive-green *quartz,* from Glatz, &c.; 11. *Aſparagus-ſtone,* from Caprera, near Cape Gate, in Murcia, Spain; 12. Piſtachio-green *apatite;* 13. *Fluor-ſpar;* not to mention the *olivine* with which the chryſolite is united by the French ſchool of mineralogy.

Olivine, though ſometimes found in large rounded maſſes, in baſalt, &c. being ſtill ſofter and leſs ſightly than the real chryſolite, has, for aught we know, never been employed for purpoſes of ornament.

The *art of imitating gems,* or precious ſtones, is intereſting as a branch of experimental chemiſtry, and (though fraud and vanity may have been the principal cauſes that brought it to early perfection) venerable on account of its remote antiquity. The Egyptians were undoubtedly in poſſeſſion of this art, as ſeveral valuable relics have ſufficiently proved. Pliny tells us, that the Greeks and his countrymen were equally ſkilful in imitating emeralds and other tranſparent ſtones, by colouring cryſtals; they alſo manufactured onyx and ſardonyx, by cementing red and dark coloured to a white layer of chalcedony. Their paſtes or impreſſions of engraved gems, their cubes, &c. for moſaic pavement, their beautiful vaſes with figures in bas relief, are ſtill ſubjects of admiration to the curious. But alſo at this preſent day we are in full poſſeſſion of the art of counterfeiting precious ſtones; indeed, there is none, except the noble opal, which has been found too difficult for imitation. It is no eaſy matter, by mere inſpection, to diſtinguiſh the better kind of factitious ſtones or paſtes from the real gems, for which they are ſubſtituted; and the difficulty of diſcriminating them increaſes in proportion as it becomes impracticable to examine into thoſe external and phyſical characters by which they were eaſily diſtinguiſhed before they had paſſed through the hands of art. But a deficiency in luſtre, a low degree of hardneſs, yielding, even in the moſt perfect paſtes, to the edge of a knife, and their ſpecific gravity ſeldom exceeding that of common glaſs, are among the ſureſt criteria by which theſe artificial productions may be diſtinguiſhed. With regard to the laſt of theſe characters, however, it ſhould be obſerved, that what has been ſaid above, of the ſuperiority of the artificial over the true chryſopras, in point of ſpecific gravity, may paſs for an exception.

Coloured glaſſes, deſtined to imitate the diamond and other precious ſtones, do not differ from enamel except in their being tranſparent. Enamel loſes this tranſparency on account of the oxyd of tin which generally forms the baſe, and which is very difficult to vitrify. (See ENAMEL.) The coloured glaſſes, on the contrary, preſerve their tranſparency, becauſe the metallic ſubſtances uſed for colouring them undergo a complete vitrification, and intimately combine with the molecules of the glaſs. The requiſites of good artificial precious ſtones conſiſt in their being as hard as poſſible, without veſicles, of a perfect tranſparency; and in the brilliancy and equality of the colours. The laſt-mentioned quality depends on the exact mixture before fuſion. The longer the coloured glaſſes are expoſed to the action of the fire, the harder they become, and the more they are freed from veſicles. But this long continued action of the fire deſtroys and volatilizes the colouring matter, with the exception of the blue colour made of cobalt, which reſiſts the ſtrongeſt fire, and with which, therefore, artificial glaſſes of a high degree of hardneſs can be prepared. It is this impoſſibility of fixing the other colours, which renders the art in queſtion ſo difficult, and obliges moſt artiſts to be ſatisfied with ſoft glaſs, which loſes its poliſh by the ſlighteſt rubbing.

Neri's work, on the art of glaſs making, contains a great number of proceſſes to colour both glaſs and cryſtal; but thoſe who have repeated the experiments of this writer have not in all caſes been ſatisfied with the reſults they obtained. Kunkel, the commentator on Neri's work, has likewiſe deſcribed various methods of making artificial gems; he has been copied by all authors who have ſince written upon the mode of colouring glaſs, and great encomiums have been beſtowed on him by the adepts in this art. But a more modern writer on this ſubject is M. Fontanieu, who has given, in the Journal de Phyſique, an account of his experiments, which are ſaid to have been frequently repeated with the beſt ſucceſs, and to deſerve more attention than thoſe of others.

The firſt object of M. Fontanieu's reſearches, was to produce a perfectly colourleſs cryſtal, proper to take the colour intended for it, and this he calls *fondant* or baſe. They are five in number.

Firſt Baſe.—Two parts and a half of lead in ſcales, one part and a half of rock cryſtal or prepared flints, half a part of nitre, the ſame quantity of borax, and a quarter part of glaſs of arſenic, (by "parts" the author means eight ounces, hence in this caſe the quantity of the ingredients is, lead in ſcales 20℥, rock-cryſtal 12℥, nitre 4℥, borax 4℥, arſenic 2℥) being well pulverized and mixed, form the compoſition of

of the firſt baſe. This mixture being put into a Heſſian crucible, and ſubmitted to the fire, is converted into frit. When perfectly melted it is poured into cold water; after which it is melted a ſecond and a third time, always in a new crucible, and care is taken that the water for each renewal of the proceſs be perfectly clear, and that the lead which may happen to be revived be ſeparated from it.

Second Baſe.—Two parts and a half of white ceruſe, one part of prepared flints, half a part of ſalt of tartar, and a quarter part of calcined borax. This mixture is melted in a Heſſian crucible, and poured into cold water; it is then to be melted again, and waſhed a ſecond and third time, as in the former proceſs.

Third Baſe.—Two parts of minium, one part of rock-cryſtal, half part of nitre, and as much ſalt of tartar, being well mixed and melted, are poured in cold water, in the ſame manner as the former.

Fourth Baſe.—Three parts of calcined borax, one part of prepared rock-cryſtal, and one part of ſalt of tartar, are well mixed and melted, and poured into luke-warm water. After being dried the maſs is mixed with an equal quantity of minium, melted and waſhed ſeveral times, as directed above.

Fifth Baſe, or Mayence Baſe.—This is one of the fineſt cryſtalline compoſitions our author is acquainted with. Three parts of ſalt of tartar, and one part of prepared rock-cryſtal, are mixed and made into frit, on which, after it has cooled in the crucible, warm water is poured to diſſolve it. This ſolution being decanted into a ſtone-ware pan, aquafortis is gradually poured into it, until it ceaſes to effervesce. The water is again decanted, and the frit is waſhed in luke-warm water, until it has no longer any taſte. The frit is then dried, and mixed with one part and a half of fine ceruſe, or white lead in ſcales; this mixture muſt be well levigated, being beſprinkled at the ſame time with diſtilled water. To one part and a half (12 ounces) of this powder dried, add an ounce of calcined borax; let the whole be well mixed in a marble mortar, then melted and poured into cold water, as the other baſes already deſcribed. Theſe fuſions and lotions having been repeated, you mix with the whole powdered compoſition a twelfth part of nitre. This new mixture being melted for the laſt time, you will find in the crucible a beautiful cryſtalline maſs, poſſeſſing, as the author expreſſes himſelf, much of the *Orient.*

It ſhould have been obſerved before, that Mr. Fontanieu begins his operation with preparing the ſiliceous ſubſtances he employed for the proceſſes juſt deſcribed; he places them in a degree of heat capable of making the maſs red hot, after which he pours it into cold water, next he decants the water, and having dried the flinty maſs, he pounds it, and ſifts the coarſe powder through a ſilk ſieve; he then digeſts it during ſome hours with muriatic acid, which diſſolves the heterogeneous matter often mixed with the ſand; he then pours off the acid, waſhes the ſand ſeveral times to take away the acid remains; dries it, and paſſes it a ſecond time through the ſieve.

The ſubſtances employed for colouring factitious gems are metallic oxyds; and on the proper preparation of theſe oxyds depends the vividneſs of the colours.

1. From *Gold.*—To obtain the purple colour known by the name of precipitate of Caſſius, Mr. Fontanieu employs three different proceſſes, of which the following, as he acquaints us, is by far the beſt.

Diſtil in a glaſs retort, placed in a bath of aſhes, ſome gold diſſolved in aqua regia, made with three parts of nitrous, and one part muriatic acid; when the acid is paſſed over, and the gold contained in the retort appears dry, leave the veſſel to cool, then pour it into ſome new aqua regia and proceed to diſtil as before. Replace the aqua regia twice upon the gold, and diſtil the ſame. After theſe four operations, pour by little and little into the retort ſome oil of tartar per deliquium, which will occaſion a briſk effervescence; when this ceaſes, diſtil the mixture till it becomes dry, and then put ſome warm water into the retort. Shake the whole, and put it into a cucurbit, when a precipitate is depoſited, the colour of which is ſometimes brown and ſometimes yellow. After having waſhed this precipitate, dry it. The mineral purple thus prepared is ſaid to be much ſuperior to that of the two other proceſſes propoſed by M. Fontanieu, ſince two grains of it only are ſufficient to an ounce of the baſe, whilſt it requires of the other two a twentieth part of the baſe. The ſame author found alſo the means of exalting the colour of the precipitate of Caſſius by putting to it a ſixth part of its weight of glaſs of antimony finely powdered, and of nitre in the proportion of a drachm to eight ounces of the baſe.

2. From *Silver.*—The oxyd of ſilver being vitrified, produces a yellowiſh-grey colour. This oxyd enters only into the compoſition of the yellow artificial diamond and opal. Mr. Fontanieu introduces it into the baſe in the form of horn ſilver (*luna cornea*). In order to prepare it, he diſſolves the ſilver in nitrous acid, and afterwards pours into it a ſolution of ſea ſalt: a white precipitate is obtained, which, being waſhed and dried, melts very readily in the fire, and is ſoon volatilized, if not mixed with vitrifiable matter.

3. From *Copper.*—The oxyd of copper imparts to white glaſs the fineſt green colour; but if this metal be not exactly in a ſtate of oxydation it produces a browniſh-red colour. Mountain blue verdigris, and the reſidue of its diſtillation, are the preparations of copper which M. Fontanieu employs to make the artificial emerald.

4. From *Iron.*—Though it is commonly believed that the oxyds of iron communicate a very fine tranſparent red colour to white glaſs, our author could only obtain from it a pale red, a little opaque. The oxyd of iron he employed was in the proportion of the twentieth part of the baſe. There are various ways of preparing the oxyd of iron called crocus Martis, or ſaffron of Mars. In general it is neceſſary that this metal be ſo far oxydated that the magnet ceaſes to attract it. Thus one may uſe the ſcales of iron found upon the bars of furnaces, which ſerve to diſtil aquafortis. By digeſting filings of ſteel with diſtilled vinegar, then evaporating and replacing the vinegar ten or twelve times upon theſe filings, and drying them alternately, an oxyd of iron is obtained, which muſt be ſifted through a ſilk ſieve, and then calcined. The oxyd of iron, thus obtained by the vinegar, our author ſays, only introduced into his baſes a green colour inclining to yellow. By the following proceſs one of the fineſt red colours is obtained: Let an ounce of iron-filings be diſſolved in nitrous acid in a glaſs retort, and diſtilled over a ſand-bath to dryneſs. After having replaced the acid on the dry oxyd, and re-diſtilled it a ſecond and a third time, it is then edulcorated with ſpirits of wine, and afterwards waſhed with diſtilled water.

5. From the *Magnet*—It is neceſſary to calcine the magnet before it be introduced into the vitrifications; having, therefore, torrefied the magnet during two hours, it muſt be waſhed and dried. It is only employed in the compoſition of the common opal.

6. From *Cobalt.*—The oxyd of cobalt is made uſe of for introducing a blue colour into glaſs: but as this metal is rarely free from iron and biſmuth, it is firſt neceſſary to ſeparate them from it; which is done by calcining the cobalt ore in order to diſengage the arſenic; and next diſtilling the oxyd in a retort with ſal ammoniac, when the iron and the biſmuth

bifmuth are found fublimed with this falt. The diftillation muft be repeated with the fal ammoniac till this falt is no longer coloured yellow. The cobalt which remains in the cornute is then calcined in a potfherd, and becomes a very pure oxyd, which being introduced into the bafe, in the proportion of a 900th part, gives it a very fine blue colour; the intenfity of which may be encreafed at difcretion by the addition of oxyd of cobalt.

7. From *Tin*.—The oxyd of tin, which is of a white colour, renders opaque the glafs with which it is melted, and forms white enamel. For this purpofe calcine the putty of tin; then wafh and dry it, and fift it through a filk fieve. Take fix pounds of the fecond bafe, the fame quantity of the calcined putty of tin, and forty-eight grains of manganefe.

8. From *Antimony*. Antimony is only fufceptible of vitrification in a certain ftate of oxydation, and then it produces a reddifh hyacinth-coloured glafs; but if the antimony be in a ftate of abfolute calx, fuch as the diaphoretic antimony, then it is no longer vitrifiable, and may be fubftituted for oxyd of tin, to make white enamel. M. Fontanieu makes ufe of it in the compofition of artificial topazes.

9. From *Manganefe*.—Employed in a fmall quantity, this metallic fubftance renders the glafs whiter; a larger quantity produces a very fine violet colour, and a ftill larger dofe renders the glafs black and opaque. There are two ways of preparing manganefe. The moft fimple confifts in expofing it to a red heat, and then quenching it with diftilled vinegar: it is afterwards dried and powdered, in order to pafs it through a filk fieve. The other method, of preparing the manganefe proper to furnifh a red colour, is defcribed by Haudiquer de Blancourt, who calls it "fufible manganefe." Take of manganefe of Piedmont one pound; torrefy and pulverize it; then mix it with a pound of nitre, and calcine the mixture during twenty-four hours; afterwards wafh it repeatedly in warm water, till the water of the leys has no longer any tafte; dry the manganefe, and mix with it an equal weight of fal ammoniac; levigate this mixture on a flab of porphyry with fulphuric acid, diluted with water to the ftrength of vinegar. Dry the mixture, and introduce it into a cornute; diftil by a graduated fire; and when the fal ammoniac is fublimed, weigh it, and add to the mixture an equal quantity. Then diftil and fublime as before, and repeat the operation fix times, being careful at each time to mix the fal ammoniac and the manganefe upon the porphyry with diluted fulphuric acid.

At Turnhault, in Bohemia, a fufible glafs is fold of a yellow colour, very like that of the Brazil topaze: which, when expofed to a degree of fire in a cupel fufficient to redden it, becomes of a very fine ruby colour, more or lefs deep, according to the degree of fire to which it has been expofed. Fontanieu, who affayed this glafs, found it to contain a great deal of lead; but was not able to difcover any gold in it.

M. Fontanieu obferves, that there are three *degrees of fire for factitious gems*, very different in their energy. The fire kept up in the wind furnaces in the laboratory of chemifts, is lefs active than that whofe effect is accelerated by means of bellows; and a fire fupported by wood, and kept up during fixty hours without interruption, produces fingular effects in vitrification, and renders the glafs finer and lefs alterable. When recourfe is had to the forge, in order to operate a vitrification, it is neceffary to turn about the crucible from time to time, that the mafs may melt equally. Some coal alfo fhould be replaced in proportion as it confumes towards the nozle of the bellows; for without this precaution we fhould run the rifk of cooling the crucible oppofite to the flame, and probably of cracking it. Though this is the readieft way of melting, it fhould not be employed out of choice; for the crucible often breaks, or coals get into it, which may reduce the lead to the metallic ftate. The wind furnace is either fquare or round. A fmall cake of baked clay or brick, of the thicknefs of an inch, is placed upon the grate, and upon this cake is placed the crucible, furrounded with coals. The degree of heat produced by this furnace is much lefs than that of the forge; but in order to fucceed in the vitrification, M. Fontanieu recommends the ufe of a furnace defcribed by Kunkel, of which the interior part is fo difpofed, that we may place crucibles at three different heights; and the name of "chambers" is given to thofe fteps on which the crucibles are placed. It is obvious that the degree of heat cannot be equal in thefe three chambers. In the firft, or loweft, the heat is greateft; it is lefs in the fecond, and ftill lefs in the third or higheft. We fhould begin by placing the crucibles according to their fize in thefe different chambers; by which means the beft effect in vitrification is produced. In order to conduct the fire well, only three billets of wood fhould be put into the furnace at a time for the firft twenty hours; four billets at a time for the next twenty hours; and fix billets for the laft twenty hours; in all fixty hours. The furnace is then left to cool, care being taken to ftop the air holes with fome lute; and in about forty-eight hours after, when the kiln is quite cold, the crucible is to be withdrawn.

Compofitions.—To make the *white diamond*, take the above fifth, or bafe of Mayence. This bafe is very pure, and has no colour.

This is fimilar to the beautiful white pafte, fo generally known by the appellation of "Strafs," which was the name of its inventor.

For the *yellow diamond*.—To an ounce of the fourth bafe add, for colour, 24 grains of horn filver, or ten grains of glafs of antimony.

For the *fapphire*.—To 24 ounces of the Mayence bafe add, for colour, two drachms, 46 grains of the calx of cobalt.

For the *oriental ruby*.—1. To 16 ounces of the Mayence bafe, add, for colour, a mixture of 2 drachms 48 grains of the precipitate of Caffius, the fame quantity of crocus martis prepared in aquafortis, the fame of golden fulphur of antimony and of fufible manganefe, with the addition of two ounces of rock cryftal: or, 2. To 20 ounces of the bafe made with flint, add half an ounce of fufible manganefe, and two ounces of rock cryftal.

For the *Balás ruby*.—1. To 16 ounces of the Mayence bafe, add the above colouring powder, but diminifhed a fourth part: or, 2. To 20 ounces of the bafe made with flints, add the fame colouring powder, but with a fourth lefs of the manganefe.

For the *oriental topaze*.—To 24 ounces of the firft or third bafe, add for colour five drachms of glafs of antimony.

For the *Brazil topaze*.—To 24 ounces of the fecond or third bafe, add for colour 1 ounce 24 grains of the glafs of antimony, and 8 grains of the precipitate of Caffius.

For the *Saxon topaze*.—To 24 ounces of the firft or third bafe, add, for colour, fix drachms of the glafs of antimony.

For the *hyacinth*.—To 24 ounces of the bafe made with rock cryftal, add, for colour, 2 drachms 48 grains of glafs of antimony.

For

For the *amethyſt*.—To 24 ounces of the Mayence baſe, add, for colour, four drachms of prepared mangeneſe and four grains of precipitate of Caſſius.

For the *emerald*.—1. To 15 ounces of either of the baſes, add, for colour, one drachm of mountain blue, and ſix grains of glaſs of antimony; or, 2. To an ounce of the ſecond baſe, add, for colour, 20 grains of glaſs of antimony, and 3 grains of calx of cobalt.

For the *beryl*.—To 24 ounces of the third baſe, add, for colour, 96 grains of glaſs of antimony, and 4 grains of calx of cobalt.

For the *common opal*.—To an ounce of the third baſe add, for colour, ten grains of horn-ſilver, two grains of magnet, and 26 grains of an abſorbent earth.

Gems. *Engraved gems, engraved ſtones; pierres gravées, gemmes*, Fr.; *gemme, gemme antiche figurate*, Ital.; *geſchnittene ſteine, gemmen*, Germ.; *gemmæ, gemmæ cælatæ*, Lat.; names given to the productions of an art which was held in great eſtimation by the ancients, and has alſo in modern times maintained its rank among the fine arts dependent on deſign. It would be fruitleſs to attempt tracing the hiſtory of the origin of the *Glyptic Art*, (for this is the name which modern writers have given to the art of engraving figures on hard and precious ſtones—the Γλυπτικὴ of the Greeks,) to thoſe remote periods of which ſcarcely any records remain; but the numerous engraved ſtones ſtill extant enable us, with tolerable exactneſs, to mark the principal eras through which that art has paſſed. Upon the whole, it appears, that its origin is coeval with that of the ſiſter arts, in which the ancients excelled; that, like them, it had its zenith of perfection; was, with them, buried under the ruins of the Roman empire, and revived towards the end of the fifteenth century.

From the moſt ancient records we poſſeſs, the holy ſcriptures, it appears that the glyptic art was practiſed as early as the time of Moſes, who mentions the artiſts that were employed to engrave in onyx the names of the twelve tribes. But from ſome apparently very ancient engraved gems diſcovered in India, with Shanſcrit inſcriptions, Raſpe and others have inferred, that Aſia has a fair claim to the honour of having been in the poſſeſſion of that art even before Egypt: but their mode of reaſoning does not appear altogether concluſive. The mechanical part of the art of engraving was carried to a high pitch of perfection by the Egyptians, but they can ſcarcely be ſaid in any inſtance to have elevated their minds to the conception of ideal beauty. They firſt employed this art for engraving hieroglyphic figures on baſalt and granite, and afterwards extended it to thoſe hard ſtones of which we find moſt of their ſeals and ſcarabæi are formed, ſome of which are of admirable workmanſhip.

The exact period when this art was introduced into Greece cannot eaſily be determined. Pliny ſuppoſes that rings were not known at the time of the Trojan war; but Plutarch is of a contrary opinion, for, according to him, Polygnotes had repreſented Ulyſſes with a ring on one of his fingers. Winkelmann ſuppoſes, that one of the moſt ancient gems of Grecian workmanſhip we know, namely, that on which the dying Othryades is repreſented, dates as far back as the time of Anacreon. The firſt name of any engraver mentioned by the writers of antiquity, is that of Theodorus of Samos, who is ſaid to have engraved, 740 years before Chriſt, that famous emerald which Polycrates threw into the ſea.

The Greeks were the moſt paſſionate lovers of rings and engraved ſtones. Of the Cyrenians it is ſaid, that the moſt parſimonious among the higher claſſes were ſeen to wear rings of the value of ten minæ. They were a moſt eſſential ornament on the fingers of flute players and other muſical performers. In Greece, the art had arrived at the higheſt pitch of perfection at the time of Alexander the Great. It appears, that under the Roman emperors, ſome excellent engravers of gems repaired to Rome, to practiſe their art; but it is uncertain whether they actually introduced it: all we know is, that the Latin tongue had no term to render that of Δακτυλιογλυφεῖς, and that among the many Greek names perpetuated on ancient gems, there are but few that appear to have belonged to Roman artiſts. The glyptic art maintained a tolerable degree of excellence till the time of Septimius Severus, when, together with the other arts, it begun gradually to decay. From Rome it ſpread almoſt over the whole weſt of Europe; but at the time of the laſt emperors nothing remained except the mechanical part: the genius and ſpirit of the art, the correctneſs of deſign and taſte, the nobleneſs of expreſſion, and even many of the practical advantages of which the ancient maſters had availed themſelves for conveying their grand ideas on the ſtone, were all vaniſhed together. But, from the decline of the Roman empire, during the darkneſs of thoſe ages, in which all the arts and ſciences hovered on the very brink of perdition, the mechanical part of the art was ſtill, in ſome meaſure, preſerved, both in Italy and the provinces of the Greek empire. Many gems, eſpecially in relief, called cameos, were manufactured as well for ornamenting holy veſſels, as prayer, and other religious books. Nor was the uſe of ſeals and ſeal-rings altogether diſcontinued. In the royal library at Berlin were preſerved ſeveral litany and pſalm-books of the 9th and following century, richly ornamented with engraved ſtones of the ſame periods, and ſome of them, according to Sulzer, were not without merit. In the ſame manner the author of the "Memorie degli intagliotori moderni," mentions an engraved gem of the fourteenth century, he ſaw at Bologna, which was very well executed (molto ben fatto). From this it would appear, that the art has, in ſome meaſure, maintained itſelf in Italy and Germany, as well as in the provinces of the eaſtern empire; and it was in the former, where, in the fifteenth century, it again roſe to endeavour to reſume its former ſplendour. Giulianelli, the author of the above-mentioned "Memorie," appears to judge right, in obſerving, that the principal cauſe of the revival of the glyptic art in Italy, under the popes Martin V. and Paul II. was the then prevailing taſte for collecting the numerous remains of ancient art; and the engraved gems were naturally the firſt objects that engaged the attention of the lovers of the antique. But with redoubled vigour it began to thrive in the ſecond half of the fifteenth century, under the foſtering care of that great patron of arts and ſciences Lorenzo de' Medici, who not only formed a conſiderable collection of antique gems, but moſt munificently encouraged the artiſts of the time to the imitation of the maſter-pieces of antiquity. But that this art was not entirely new at that period, and that it was not Florence in particular where it was reſtored to life, appears from the contemporary productions of Domenichino, a Milaneſe, who, on account of his ſkill in executing raiſed work, was furnamed *Da Camei*. When the art of engraving on hard ſtones was thus encouraged, and again cultivated with zeal, by artiſts of genius, it could not fail to make rapid ſtrides towards perfection. Before the conqueſt of Rome, in 1527, a great number of excellent artiſts reſided in that capital, and ſome of them imitated the works of excellent maſters with ſuch ſucceſs, that the greateſt *cognoſcenti* of thoſe times were not unfrequently deceived by them. From this ſecond native land of the arts and ſciences, the art of engraving on ſtones ſpread over other

countries of Europe. Sandrart mentions an engraver of ſtones at Nuremberg, of the name of Engelhard, as a friend of Albert Durer. France owes the introduction of this and all other arts to Francis I. who invited celebrated Italian artiſts to ſettle in that country. Spain had likewiſe ſome Italian maſters in the reign of Philip II.; and England, ever ſince the time of Elizabeth, can boaſt of artiſts, in every reſpect ſuperior to thoſe of the French ſchool.

The ſtudy of *antique* engraved gems has in all times engaged the attention, not only of the antiquary, but of men of ſcience in general, and principally of thoſe artiſts, who conſider taſte and claſſical knowledge as objects not unworthy of obtaining. It is needleſs to expatiate on the importance of which gems are to the hiſtorian and antiquary; ſuffice it to ſay, that the knowledge of a variety of ſigns and ſymbols, of ſubjects of mythology and hiſtory, ſuch as the images of gods, heroes, and celebrated men repreſented on them, cannot be derived from a ſource more authentic and ſatisfactory than they. Even thoſe ruder productions of early periods are intereſting, ſo far as they aſſiſt in tracing the progreſs of the arts dependent on deſign. But by far the greater part of antique gems that have reached modern times, (and indeed their ſuperior durability, and other favourable circumſtances, have fortunately preſerved a great number of maſter-pieces from the ravages of time and barbariſm,) may be conſidered as ſo many models for forming the taſte of the ſtudent of the fine arts, and for ſtoring his mind with correct ideas of what is truly beautiful.

In order to judge with preciſion of the merits of engraved ſtones, not only ſome taſte and acquaintance with the art of deſign are required, but likewiſe a competent knowledge of hiſtory and mythology, and of the hiſtory of the art in general, by which we are, in moſt caſes, enabled to aſcertain, whether a given gem be of Egyptian, Etruſcan, Grecian, or modern origin; nor is it leſs uſeful, for the above purpoſe, to be acquainted with the ſubſtances that have been employed both by ancient and modern engravers. The former of theſe requiſites conſtitute the object of particular ſciences; and with regard to the latter, it will ſuffice to give a ſhort enumeration of thoſe ſubſtances. Before we proceed, it may be proper to obſerve, that ſtones, convex on one ſide, are called *cabochons*, or cut *en cabochon*; *ſcarabæi* are oval engraved ſtones, with the upper ſurface cut in the ſhape of a beetle, or ſcarabæus, of which ſometimes only the engraved baſe is remaining; *grylli*, carricature heads, or heads with diſtorted features, ſo called from an Athenian of the name of Gryllus, famous for his uglineſs; *caprices*, or *ſymplegmata*, are heads grouped together in a fantaſtic manner, ſuch as the head of Meleager joined to that of a wild boar; *chimæras* are imaginary beings, produced by the monſtrous union of the members of ſeveral creatures into one; *joined* (*conjugata*) are heads repreſented together on the ſame profile; and *oppoſite* they are called if they face each other.

The *animal* and *vegetable* ſubſtances on which engravers of gems have exerciſed their ſkill ſcarcely merit to be mentioned in this place; nor did the ancients make uſe of any of the former for this purpoſe, except *ivory*, which they were fond of working (ſee IVORY); but none of the works in it that may be conſidered as cameos have eſcaped deſtruction. Shells have been uſed for engraving gems, but only by modern, eſpecially Italian and Dutch, artiſts: they employed the pearl-oyſter, (mytilus margaritiferus); the thick ſailor-ſhell (nautilus pompilius); ſeveral ſpecies of trochus, cardium, tellina, and cypræa. Of *vegetable* ſubſtances that may have been employed for this purpoſe by the ancients, nothing remains but ſome ſmall pieces of ſycamore wood of Egyptian origin, on which hieroglyphic characters are engraved.

Mineral ſubſtances, from their hardneſs and other uſeful qualities, are more fit for the purpoſes of the engraver; and none more ſo than thoſe belonging to the ſiliceous genus of the earthy claſs of minerals. That aſſemblage of ſtones, however, which is diſtinguiſhed by the name of *precious ſtones*, or *gems* in another ſenſe of the word (ſee the preceding article GEMS,) has ſcarcely ever been employed by the ancients for the purpoſe of engraving upon. Theſe ſcarce and ſplendid ſubſtances were conſidered ſufficiently valuable in themſelves, and the art of engraving was more judiciouſly employed to enhance the value of other leſs expenſive ſtones, which moreover poſſeſſed, in a ſuperior degree, all the properties requiſite for the niceſt execution. Leſſing has proved that what Pliny ſays of the luxury of the ancients, with regard to gems, does not apply, as ſeveral antiquaries have imagined, to engraved, but to precious ſtones, whoſe weight and luſtre they did not chooſe to impair by the engraver's tool; modern artiſts, however, have frequently employed them.

Diamond.—The ancients were ignorant of the art of cutting this gem. They ſet the diamonds in their rough ſtate, preferring thoſe which nature had cut for them in an octohedral form. Theſe, which the French call *à pointes naïves*, we ſee in rings and other ancient jewellery prior to the year 1456, when Louis de Berquen invented the art of cutting and poliſhing this precious ſtone (ſee DIAMOND). The four diamonds in the claſp which belonged to the dreſs of Charlemagne, and which was preſerved at St. Denis, were of this deſcription. But it is probable that the ancient engravers made uſe of fragments of diamonds for finiſhing their work. Jacopo da Trezzo appears to have been the firſt who engraved on diamond; but Mariette ſuppoſes that Clement de Birague executed this taſk in 1564, while others mention Ambroſe Charadoſſa as having, in 1500, engraved the portrait of a father of the church on a diamond, and ſold it for 22,500 crowns to pope Julius II. Natter and Coſtanzi have likewiſe engraved on diamonds; but neither to the advantage of the ſubſtance nor to that of the workmanſhip.

Sapphire and *Ruby.*—(See the article GEMS, *Sapphire.*) Neither of theſe two very hard ſtones has been engraved on by the ancients; and indeed the latter, which they called anthrax, or carbunculus, was ſuppoſed by them to melt the wax. The ſapphire has been mentioned by Raſpe and others as the ſtone on which the beautiful antique head of Julia is engraved, and which is in one of the public collections of Paris: but this is one of the groſs errors ſo common among antiquaries unacquainted with mineralogy; the ſtone in queſtion being nothing but the common beryl or aqua marine, or perhaps only a bluiſh rock-cryſtal. A few modern engravers, however, have employed both ſapphire and ruby. The cabinet of the duke of Orleans poſſeſſed a portrait of Henry IV. executed in ſapphire by the celebrated Coldoré. A German artiſt, Hoefler, has likewiſe exerciſed his ſkill on it.

Topaze.—It has been ſuppoſed, that the ancients did not engrave on this ſtone, which was the chryſolithus of the Greeks and Romans. (See GEMS, *Topaze.*) But Mellin informs us, that the beautiful intaglio, repreſenting an Indian Bacchus, (a gem figured by Buonarroti in his work on the medals of the cabinet Carpegna, and now in the cabinet of antiquities of the imperial library at Paris,) is a topaze; as alſo that the cabinet of the emperor of Ruſſia poſſeſſes

possesses several portraits of emperors and empresses on the same stone: but we are not told what kind of topaze they are. Of the works of modern artists on topaze, one of the best is that representing the heads of Philip II. and Don Carlos, in the just mentioned cabinet: this is a whitish topaze, which, as the work is that of Trezzo, has for a long time been mistaken for a diamond.

Emerald.—It appears that the ancients were acquainted with the pure green emerald, which is at present only found in the new world (see Gem, *Emerald*); but they held it in so great estimation that it was seldom used for engraving upon; and Pliny even asserts, that, for the above reason, it was never applied for that purpose; but this writer appears afterwards to contradict his own statement. What we know for certain is, that scarcely any well authenticated antique engravings on emerald remain. The moderns have frequently engraved on this precious stone, the hardness of which does not much exceed that of rock-crystal. There is a head of Henry IV. and another of Louis XIV. on emerald, in one of the public collections at Paris. The *beryl*, or *aqua marin*, a variety of the green emerald (see Gem, *Beryl*), is well described by Pliny, but not frequently met with among the remains of ancient art. The museum of the imperial library at Paris possesses a head of Julia, daughter of Titus, engraved by Evodus, on a bluish transparent stone, which is probably a true beryl, though it may turn out to be rock-crystal: it is often difficult to distinguish these two substances when cut and polished; but whatever the one just-mentioned may be, the engraving on it is, according to all accounts, a most beautiful work of art.

Hyacinth.—The hyacinth is mentioned among the stones which the ancients employed for engraving on, but on very uncertain authority; nor is it known what the ancients understood by their hyacinth. It was certainly different from ours, for it is described as of a violet colour, and may therefore be considered as mere amethyst quartz. Modern artists have sometimes engraved on our hyacinth and on jargon, but nothing of any importance is known to be executed in them.

Garnet.—The noble garnet, if we may trust the accounts we find of engravings said to be in garnet, has been often employed both by modern and ancient artists. A first rate production of the art, equally celebrated for high relief of the figure, and the superior beauty of the work in general, is the dog Sirius with the name Γαιος on it (though Raspe suspects Natter to be the real artist); it is preserved in the collection of the duke of Marlborough, and, in the work descriptive of that collection, called a garnet. In general the grain of the garnet is not such as to render it a desirable substance for engraving upon.

Rock-crystal—has been employed by the engravers of all times, both for intaglios and cameos. The coloured varieties have, in general, been preferred, especially the violet, called *amethyst*, and the brownish or blackish, also known by the name of smoky topaze. (See Rock *Crystal*). It is not, in all instances, easy to ascertain what the ancients meant by *amethystus*; but there can be no doubt that all antique violet-coloured engraved gems at present extant in the cabinets are nothing but our common amethyst quartz, also called by some lapidaries *prime d'amethyste*, on the erroneous supposition that it is the matrix of the oriental amethyst; which latter (being a violet variety of the sapphire) was, for the reasons above stated, not attempted by the engravers of antiquity.

Of semi-transparent stones belonging to the siliceous genus, several have been employed. The *prase*, one of the substances confounded by the ancients with the emerald, is a quartzy substance of the colour of leek, whence it has obtained its name. (See Prase.) *Plasma* and *prasma* of Italian, and other modern lapidaries, are corruptions of *prase*; as is the word *prisme* and *prime d'emeraude*, which latter corruption has given rise to the erroneous idea that this substance is the matrix in which the true emerald is generated.

Chrysoprase—a translucid siliceous stone, of apple-green colour (see Chrysoprase), which has been confounded both by lapidaries and mineralogists with the prase. It has, for aught we know, been employed by modern engravers only; and, indeed, the true chrysopras has been hitherto found only in Silesia.

Opal.—The noble opal was too highly esteemed by the ancients as a precious stone to find its way into the hands of the engraver; nor were the common varieties, which do not reflect the vivid colours of the former, used for the purpose of engraving upon, on account of their softness. Of modern productions of the art in opal, a cameo is mentioned representing the portrait of Louis XIII. when a child.

Hydrophane—a variety of the opal, which has likewise been mentioned as a substance on which the ancients used to engrave, but this is not very probable, on account of the softness of the stone, and because the ancients, if they were really acquainted with it, as some writers suppose, must have valued it too highly to apply it to that purpose. Winkelmann, in his "Description des Pierres gravées du Baron de Stosch," p. 190, describes a stone which he calls a sardonyx, of three colours, representing Apollo with the lyre: the lower white layer of this stone, he says, turns quite black, when the ring in which it is set is on the finger, but it soon recovers its original whiteness when not worn. The only way of accounting for this phenomenon, is to suppose that the white layer nearest to the finger is a real hydrophane, which, when worn, becomes transparent by the moisture of the finger, and consequently shews the black stratum underneath, which makes the white transparent layer appear as if it were itself of a black colour.

Calcedony and *Carnelian* are, with regard to their substance, very nearly related, but they differ in colour: that of the former is generally milk and bluish white, sometimes approaching to sky blue; but it is also found of different tints of yellowish and reddish, when it passes into carnelian. The true calcedony is of a greyish white-colour, and when polished and held between the eye and the light, always exhibits marks similar to the scoopings made with a knife on wood; these marks are in the interior of the calcedony, and proceed from the distinct mamillary concretions in which it is originally formed. The ancients obtained their best calcedony, by way of Carthage, from the mountains of the country of the Nasamones in Africa, and also from Thebes. There are many master-pieces of ancient glyptic art in calcedony extant; for instance, the celebrated Dyonisiac bull by Hyllus. The calcedony is generally called *white carnelian* by the lapidaries.

The *carnelian* varies in its colour from deep cherry, and even blood red, to reddish white, and passes on one side into dark brown, and on the other into yellow of several degrees of intensity; it has obtained various names according to the tints it exhibits, but all of them are vague and promiscuously applied. A general term for this stone with the ancients appears to have been *Sarda:* what they called Indian *morion* is probably the very dark brown variety, forming the base of the Nicolo. The purest, and most transparent carnelians are found among the remains of ancient art, and, indeed, most of the antique engraved gems we see, are superior to any of the modern. Natter, who did not overlook this circumstance, suspected that the ancients had a particular way of clarifying the less pure carnelians, and to give them a brighter and more uniform colour: a suspicion which would have been converted

verted into conviction, had that artist known that the art of improving the colour of those stones is practised at this very day. We have seen the yellow variety of little value, which is brought from India as beads and polished pieces, tinged (apparently by a very simple process) throughout, and in the most permanent manner, with the most vivid and uniformly diffused cherry red. The Japanese are likewise said to possess the art of heightening the colour of carnelians; but, in order to keep up the high price of this article of trade, they, now and then only, throw in a few of the refined among a great number of ordinary carnelians, which they send to Europe. Pliny mentions the honey of Corsica as having the quality of clarifying carnelians, if kept in it for some time. Though this is undoubtedly fabulous, it appears from it, that in Pliny's time there was a notion of the practicability of such a conversion; and it is probable that the process was known to a few artists or lapidaries only. Nor is it improbable that the ancients obtained some of their carnelians from parts of Asia or Africa, with which the intercourse has since been discontinued: the distinction between *carnelians of the old rock*, and *carnelians of the new rock*, by which names the lapidaries on the continent denote those of superior and ordinary quality, appears to have originated in that belief. The ancients called carnelians of the best sort *male*; and *female* those of a dirty yellowish red, in short the carnelians of the new rock of the modern. The English lapidaries give to the pure cherry-red variety, possessed of a certain degree of transparency, the name of *beryl*; a misnomer as absurd, as it is productive of confusion, especially if describers of gems, as has been the case in some instances, will condescend to adopt it.

Carnelian is the stone which was most commonly employed by the greatest artists of antiquity, and indeed its moderate hardness, combined with the exquisite delicacy of its texture, which makes it susceptible of the finest polish, will ever secure it a distinguished rank among the stones most desirable to the engraver of gems.

If the calcedony occurs with opaque stripes, of a pure white colour, it is, or should be, called *onyx*. This appears to have been the original idea conveyed by the name onyx, which has since been given to many agates, jasp-agates, &c. in which several stripes or zones of different colour are alternating with each other. The white opaque zones, which are wrought into raised figures on the semi-transparent ground, appear, in most instances, to be *cacholong*, or the result of decomposition: but if so, it is difficult to account for the sharpness with which these zones are separated from each other, especially in such onyxes where there are two or three regular alternations.

The name of *sardonyx* is still more vague in its present application than that of onyx. Originally it appears to have meant a combination of zones of carnelian (sarda) with others of calcedony, either fresh or in the state of cacholong, or with both. Indeed, Pliny himself had no clear idea of its distinctive character; but much more confused than his, are the ideas of more modern writers, by whom almost every semi-pellucid striped pebble is dignified with the appellation of sardonyx. What lapidaries of the present day generally consider as sardonyx, are all those calcedonic substances of a pale reddish grey, more or less mixed with shades of yellowish or brown, often intermixed with straight or curved narrow whitish stripes. If without stripes, it may be considered as a mere brownish-red calcedonic mass, forming, by insensible degrees, a passage into carnelian.

The substance called by the Italians *nicolo*, (a corruption of the word onyx, of which *oniculus* was made, and afterwards *niccolo*,) belongs, properly speaking, to the original sardonyx: it is a zone of deep brown carnelian, appearing black, with a zone of bluish calcedony upon it; if this latter is cut away, so as to leave only a thin crust or film, the figures engraved on it, and even superficial strokes made by the graver, will pierce this delicate crust, and appear black, on a bluish-white ground; and in the same manner a slight facet round the margin of the stone will produce a black border. Veltheim and others have supposed these nicolos to be artificially composed of volcanic glass, or obsidian, and calcedony cemented together; but those that we have had opportunities of examining were real productions of nature, reduced into a new form by the lapidary's wheel. The quarries from which this and most of the oriental sardonyxes were obtained appear to be lost, unless we suppose, with count Veltheim, that the mountains which Ctesias mentions as producing sardonyx, are those of the west coast of the peninsula of Hindoostan.

Both onyx and sardonyx, and other striped calcedonic substances, have been employed by ancient and modern artists for executing those gems in relief-work, called *cameos*; and it is pleasing to see with what dexterity they have frequently availed themselves of the different colours of the alternating zones to express the different parts of a figure, such as hair, garments, &c. In this manner, if a white semi-transparent zone be superincumbent on a zone of carnelian, the red ground will impart a beautiful flesh colour to the white face; and if the white be between red and brown, or any other colour, the latter may, with excellent effect, be converted into drapery, &c.; as we see it done in numerous antique and modern cameos. As celebrated productions of the ancients in this part of the art we mention the apotheosis of Augustus, of two brown and two white layers, being an oval of eleven inches by nine; the apotheosis of Germanicus, likewise of four zones; the celebrated Brunswick vase, representing Ceres in search of Proserpine; Germanicus and Agrippina in a car drawn by two dragons; Agrippina and her two children; Tiberius; the quarrel of Minerva with Neptune; head of Augustus, all of three layers, mostly brown and white; Jupiter Agiocus, white and black zones, like the following two; Venus on a sea-horse, surrounded by cupids; a bull: all which master-pieces are *now* in the "Bibliotheque Imperiale" at Paris.

Of opaque siliceous stones, the following are frequently made use of by gem engravers; *heliotrope*, or *blood-stone*:—deep leek green, generally besprinkled with blood-red spots, which are grains of red jasper disseminated in the green base. This latter, according to Werner's opinion, is an intimate combination of calcedony with green earth. Indeed, we have specimens before us which shew the gradual mixture of the two substances in a very distinct manner. Blood-stone is at present much used for seal stones; but also the ancients employed it for this purpose. It has a fine grain, and is moderately hard; but the grains of red jasper will sometimes crumble out when the stone is worked. The artists who have engraved on this stone have availed themselves with advantage of the red spots: thus, among the modern works in blood-stone, there was in the royal collection at Paris a bust of Christ under flagellation, in which the drops of blood were represented by the spots themselves.

Jasper.—This stone is found of a great variety of colours. (See Jasper.) It is neither so hard nor so fine-grained as the last-mentioned substances, whence it has not been frequently employed by the great masters of antiquity. We shall mention a few of the varieties of the common jasper, of which antique gems are known to be extant; the *dark green jasper* is often seen in the form of Egyptian scarabæi, seldom as flat seal stones: besides in Egypt, it is found

found in some parts of Italy and France; *yellow* jasper, on which there are likewise found some Eyptian engravings; the *red* jasper which takes a very fine polish: Marsyas flayed by Apollo, and other subjects, have been frequently represented on it. Besides these, we now and then find striped, and even party-coloured jaspers with intaglios, which sometimes appear so confused, that the subject of the engraving can scarcely be distinguished on the stone. The difficulty of engraving on this kind of stones will scarcely be admitted as an apology for preferring them to others better calculated for the purpose. Modern engravers have sometimes employed the Siberian jasper with beautiful brown and green stripes.

Lapis lazuli, or *azure-stone*, very well known to yield the beautiful blue colour, called ultramarine. This stone is the *sapphirus* of the ancients, but it is also mentioned by them under the name of *cyanus*: it takes a very good polish, and when free of pyrites and quartz, which it is sometimes seen to contain in great quantity, is fit for the purpose of engraving upon, though its hardness is inconsiderable; whence scarcely any highly finished work has been executed on it. Bad engravings on lapis lazuli are frequently seen.

None but the Egyptians have engraved small objects on compound rocks, such as granite and porphyry; of which we possess scarabæi bearing hieroglyphic figures.

A substance, which has been employed by some ancient, especially Egyptian, engravers, is the *turquois*. This name has been given to fossil teeth, or other hard bony substances, which, probably by infiltration of a solution of either copper or iron, have received a beautiful sky-blue colour in the bowels of the earth. It was formerly held in great estimation as one of the opaque gems; and a distinction was made between the *oriental*, or those of the old rock, and the *occidental*. In this case, the epithet of *oriental* is properly applied; for those of the best quality certainly come to us from Turkey, Persia, &c. The occidental are of a greenish-blue colour, and are often no true turquoises; malachite, and other greenish carbonates of copper, and also greenish-blue feldspar, called Amazone-stone, being sometimes sold for turquoises. See Turquoise.

Of *metallic* substances that have been employed for gem-engraving, we mention the following:

Malachite, a well-known green carbonate of copper, much used for purposes of jewellery, but which has in a few instances only been tried by modern engravers: it is much too soft to be employed Pliny, who recommended *malachites* for intaglios, must have alluded to a substance different from our malachite.

Magnetic Iron-stone, or *Magnet*, has been frequently made use of by ancient engravers, especially by those of Egypt and Persia. The Persian cylindrical seals were not seldom made of this metallic substance.

Hæmatite, another oxyd of iron, has often been used for scarabæi, and intaglios by the Egyptians: there is, among others, a fine horus on hæmatite in the principal public library at Paris.

Some intaglio and cameo engravings on *inflammable substances*, such as amber, jet, and cannel-coal, have been executed both by ancient and modern artists; but they are of little importance, and the substances themselves are so soft and brittle, that it is enough barely to mention them.

It has been before observed, that the honour of the invention, or at least of a prior possession of the glyptic art, is supposed by some to be due to India, from whence it is said to have found its way into Egypt. Mr. Raspe, who is of this opinion, chiefly grounds it on the circumstance that there are several engraved gems of considerable finish, bearing inscriptions in Shanscrit, and which must, therefore, have been executed at a period much more remote than any of those which produced the works of Egyptian art we are acquainted with: Mr. Raspe, in support of what he has advanced on this subject, refers to the Indian engraving on lapis lazuli belonging to Mr. Townley, which is in the style of the ancient Indian bas-reliefs found in the grottos of Salsetta and the island of Elephanta; as likewise to an emerald in the possession of Dr. Wilkins, on which a lion is engraved with a Shanscrit inscription. But may not the former of these engravings be supposed a modern imitation of the Salsetta and Elephanta sculptures? and, with regard to the latter, may it not be asked, how came the ancient artist by the substance on which he engraved, when the part of the world, which alone is supposed to produce it, was not discovered? for that it is not the green variety of sapphire which is sometimes called *oriental* emerald, may be inferred from the omission of this epithet in Mr. Raspe's account of this interesting gem. Of other Asiatic remains of the glyptic art, but of a much more modern date than those just mentioned are supposed to be, the Persepolitan engraved cylinders deserve to be mentioned in this place: they represent long slender figures of kings and priests, with griffins and various emblems and inscriptions in Persepolitan characters. Several of them are figured by Montfaucon, Raspe, and others; they are of calcedony, magnetic iron-stone, jasper, &c. There are also portraits of Parthian kings, with inscriptions, some of which have been explained by Sylvestre de Sacy; they are on amethysts and carnelians. But to return to the Egyptian art.

There are far more intaglios to be found among Egyptian gems than cameos, and most of them are in the form of scarabæi. The figures are generally executed with great care, but the design is dry and stiff. There is a difference between the Egyptian and the Græco-Egyptian style, (the latter is easily discoverable where Egyptian subjects are executed by Greek masters,) and the style of imitation at the time of Hadrian. The Egyptian stones represent the divinities of the country, and all the figures of representative, symbolical, and hieroglyphic writing, either united or detached. We find among the detached hieroglyphics the eye, and several figures, the meaning of which is unknown. Among the symbolical figures are the persea, lotus, cynocephalus, the hawk, the crocodile, sphinx, &c. among the divinities, Isis, Osiris, Horus, Anubis, Harpocrates, &c. single or together, often in a bark made of papyrus, and with various attributes, such as the sistrum, the scourge, &c. It has been maintained, that the Egyptians never engraved cameos, but this is a mistaken notion; for though they are very rare, and none of them of high antiquity, yet we must consider as cameos the upper part of the scarabæi, which is always relief-work. The Egyptian engraved gems are not very common. Cardinal Borgia possessed a considerable number of them, and several are preserved in the British museum.

The ancient inhabitants of several parts of Africa were in possession of the art of engraving, which they had probably received from the Egyptians. The Æthiopians, according to Herodotus, engraved seals: the stones of the rationale bore the names of tribes. The Mahometan religion does not permit the representation of images; hence, the engraved Arabic and Turkish stones offer nothing but inscriptions; we read on them either the name of the proprietor, or a passage from the Koran. Millin possesses, however, the impression of a stone, on which the writing is disposed in such a manner, as to form the figure of a man on horseback. We find also pieces of glass, with Arabic and Cuphic inscriptions, which were first mistaken for coin, but

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are now looked upon as *tesseræ*, for the diftribution of money and corn.

The Etrufcans appear to have received the mechanical part of engraving on hard ftones from the Egyptians; but they practifed it before the Greeks: they had, in the manner of the Egyptians, ftones cut into fcarabæi. But though they received this art from that ancient people, their engraved ftones bear a particular character both with regard to the art and the fubjects reprefented. Many ftones confidered as Etrufcan, are of the earlieft Greek workmanfhip; they have but little relief, and the fubjects are generally taken from the religious fyftem of Greece. Antiquaries have given, as characteriftics of Etrufcan ftyle, the granular border which furrounds the engraving, the ftiffnefs of the figures, the form of the letters, the mode of writing, the wings given to thofe deities which the Greeks reprefent without wings, and the figures being almoft always accompanied by their names. But moft of thefe fuppofed characters are alfo found on ancient productions of Grecian art. The principal ftones in the oldeft ftyle, with infcriptions, are, Atalanta, publifhed in Millin's "Monumens inédits;" Peleus dipping his hair into a water bafin, which Winkelmann fuppofes to reprefent the river Sperchius, while, according to Heyne, Peleus purifies himfelf after having flain Actor. Tydeus rubbing his body with a ftrigilis: this is Vifconti's explication, who confiders it as a copy of the Apoxyomenos, a beautiful ftatue of Polycleta, reprefenting a man in that attitude; Winkelmann, on the other hand, fuppofes Tydeus in the act of drawing a dart out of his foot. Capanæus thunderftruck on the walls of Thebes. Thefeus in the prifons of Aidoneus, according to Buonarroti; Lanzi thinks that his attitude expreffes his exile to Scyros, a fhort time before Lycomedes precipitated him from a rock. Perfeus, holding in one hand the head of Medufa, and in the other, the fword with which he has cut it off. Achilles putting on his knemides, fo often mentioned by Homer. Ajax carrying away the body of Patroclus. Hercules carrying off the tripod. Helena, with wings, as daughter of Nemefis.

The Greek engravers of gems, who, according to Millin, (the firft author who has attempted to claffify the engravers of antiquity, and whom we follow as the beft guide in this part of the prefent article,) may be fuppofed to have flourifhed before the age of Alexander, are, Theodore of Samos, who, as mentioned before, is faid to have engraved the famous emerald of Polycrates, and to whom Pliny attributes the invention of the lathe.—Mnefarius, father of Pythagoras; nothing remains of his works.—Heius (HEIOΥ; we poffefs of him a Diana Venatrix, dreffed in a long robe. The dry manner, the ftiffnefs and incoherence of the lines compofing the figure, the border round the engraving, have induced baron Stofch to look upon Heius as a very ancient artift. Winkelmann confiders the H as an afpiration. Vifconti thinks the name is a trifyllable.—Phrygillus (ΦΡΥΓΙΛΛΟΣ) Cupid iffued from an egg.—Thamytus (ΘΑΜΥΤΟΥ); Stofch fuppofes him to be a contemporary of Diofcorides, and perhaps his pupil: we poffefs of him a fphynx fcratching his ear.

Among the engravers that flourifhed from the age of Alexander to that of Auguftus, are Admon (ΑΔΜωΝ), a Hercules Bibax, formerly in the Verofpi cabinet at Rome, from whence it went to the nuncio Molenari's; it is at prefent in the duke of Malborough's collection. Vifconti mentions a beautiful head of a Hercules, with the letters ΑΔ. The letter ω in his name is of a form pofterior to the age of Alexander. Rafpe mentions a fine gem, reprefenting Vulcan and Achilles, with Admon's name engraved on it, but it is modern, and probably the work of Natter.—Apollonides (ΑΠΟΛΛΩΝΙΔΟΥ): Pliny has quoted him as a great artift. Nothing remains of him except a fragment of a fardonyx, reprefenting a cow lying. (Collect. of the duke of Devonfhire.)—Polycletus of Sycion (ΠΟΛΥΚΛЄΙΤΟΥ), difciple of Agelades, one of the moft eminent Greek ftatuaries, about the eighty-feventh olympiad. We have of him a Diomedes carrying off the palladium. This work is not exactly in the ftyle of the age in which it is fuppofed to have been executed, and perhaps the name of this artift, as Millin conjectures, has been added only to indicate that this engraving is a copy of one of his ftatues.—Pyrgoteles (ΠΥΡΓΟΤЄΛΗΣ ЄΠΟΙЄΙ). Apelles alone was permitted to paint Alexander; Lyfippus to caft his image in bronze; and Pyrgoteles had the privilege to engrave his portrait. We poffefs, under the name of Pyrgoteles, a head, faid to be Alexander's, and another of Phocion; but thefe names appear to be conjectural. The name of Phocion, indeed, feems to belong to an engraver of a head which was taken for that of the celebrated Athenian; and afterward another hand has added the name of a mafter ftill more celebrated, namely, that of Pyrgoteles.—Tryphon (ΤΡΥΦΩΝ), author of the beautiful Cameo, in the Marlborough collection, reprefenting the marriage of Cupid and Pfyche. The age of this artift is well afcertained by an epigram of Adeus the poet, who flourifhed under the kings of Macedonia, fucceffors of Alexander: the fubject of the epigram was an intaglio of Tryphon in an oriental beryl.—Chronius (ΧΡΩΝΙΟΥ), Terpfichore ftanding; a figure which has been fince repeated by Onefas and Allion. Pliny, by placing the name of this mafter between thofe of Pyrgoteles and Apollonides, has probably followed the chronological order; and this is all by which we may determine the period in which he flourifhed.

The mafters of the age of Auguftus are Quintus Alexa (—ΙΝΤΟϹ ΑΛΕΞΑЄΠΟΙЄΙ). Two legs only are remaining on a fragment, with the name of the artift. Vettori and Bracci have publifhed this ftone with the body reftored. The Knemides, a kind of half-boots, with which the legs are furnifhed, has made thofe antiquaries conjecture that the figure was an Achilles.—Cœmus or Cœnus (ΚΟΙΜΟΥ, ΚΟΙΝΟΥ); we have, with this name, a naked Adonis and a faun celebrating the Bacchanals.—Agathopus (ΑΓΑΘΟΠΟΥϹ ЄΠΟΙЄΙ). He has engraved the head of an unknown Roman. (See Epityncharus.)—Aulus (ΑΥΛΟΥ); Stofch has publifhed five gems with this name; Bracci has given twelve, and there are a great number more, the name of Aulus being one of thofe which the impoftors have made particularly free with. Rafpe thinks that there are two Aulus; Bracci goes ftill farther, and acknowledges fix different artifts of that name. Among the engraved ftones bearing the name, thofe confidered as authentic are, a Roman knight running, a quadriga, a head of Diana, one of Æfculapius, a head given by Stofch, as that of Ptolemy Philopater, and by Bracci, as Abdolonymus, in the imperial library at Paris. Thefe five are figured by Stofch. Seven others, added by Bracci, are Venus playing with Cupid, and balancing a wand on her finger; Cupid tied to a trophy; a winged Cupid fettered, digging the ground; the buft of a prancing horfe. Vifconti is of opinion that the differences of ftyle obfervable in the works attributed to Aulus are owing to his name having been frequently put on engraved ftones that were nothing but copies of his works. Indeed on comparing the Æfculapius of the Mufeo Strozzi with the other intaglios attributed to him, it is difficult to think that they were executed by the fame hand.—Cnejus (ΓΝΑΙΟϹ); a man come out of the bath holding the ftrigilis; Diomedes carrying away the palladium; a young Hercules; an unknown head of

of particular beauty, fuppofed by Bracci to be that of Cleopatra; an athlete rubbing himfelf with oil preparatory to the combat; a beautiful Juno; Lanuvina, or rather, according to Winkelmann, a Thefeus, having his head covered with the fkin of the bull of Marathon, (or that of the lion, according to Winkelmann,) but the infcription is fuppofed to be by the celebrated Pichler.—Diofcorides (ΔΙΟΣΚΟΥΡΙΔΗΣ), Apollonides, Chronius, and Diofcorides are, next to Pyrgoteles, the three moft celebrated engravers mentioned by Pliny. Diofcorides was under Auguftus what Pyrgoteles was under Alexander. Several fublime works remain of him, of which Stofch has figured feven: two bufts of Auguftus; an unknown head, faid by Baudelot to be the head of Mæcenas, but which Stofch fuppofes to be that of Cicero; Mercury, as god of travellers, with his petafus, caduceus, and penula (in the collection of lord Holdernefs, according to Winkelmann); Perfeus viewing the head of Medufa. Bracci has added fome; fuch as the head of Io; Mercurius Criophorus, *i. e.* carrying a ram, all works of fuperior beauty and excellence. The two laft have been copied by Natter, Pichler, Sirletti, and other celebrated engravers. The name of this artift fhould be written Diofcorides, fignifying the fon of Jupiter. Vifconti does not believe that the Mercury attributed to Diofcorides is the production of one and the fame graver; and he confiders his Io as one of the fineft engravings in exiftence. Another beautiful work of this artift is Demofthenes, on an amethyft, which Bracci and Winkelmann have looked upon as an unknown head. Vifconti has difcovered the native country of Diofcorides on an engraving of Eutyches his difciple, or rather his fon: it reprefents Minerva with the infcription ΕΥΤΥΧΗC ΔΙΟCΚΟΥΡΙΔΟΥ ΑΙΓΑΙΕωC ΕΠ (Eutyches Diofcoridis Ægæi faciebat); from which it appears that he was a native of Ægea, a town of Æolia, in Afia Minor.—Epitynchanus (ΕΠΙΤΥΓΧΑ); a head of Sextus Pompejus. Gori confiders this artift and Agathopus as manumitted fervants of Livia, becaufe their names are found among the fepulchres of the domeftics of the houfe of Auguftus: both have there the title "aurifex," goldfmith, whofe art was often united with that of engraving on gems; but this is only conjectural. Vifconti alfo attributes to Epitynchanus a beautiful carnelian in the poffeffion of the Chevalier d'Azara, reprefenting Bellerophon mounted on the Pegafus, with the infcription ΕΠΙ.—Eutyches (ΕΥΤΥΧΗC ΔΙΟCΚΟΥΡΙΔΟΥ ΑΙΓΑΙΕωC ΕΠ) fon or pupil of Diofcorides, perhaps both.—Onefidemus. M. Tortoli at Rome poffeffes a fine intaglio on fardonyx, reprefenting Minerva, by this artift.—Solon (CΟΛωΝ ΕΠΟΙΕΙ; CΟΛωΝΟC). It is this engraver who has put his name to a head, faid to be that of Mæcenas or Cicero, which, at firft, on account of the identity of the names, was fuppofed to be the portrait of the celebrated legiflator. It was Baudelot who difcovered the miftake. Solon is alfo (among feveral other works attributed to him) the author of a fine head of Medufa.

The engravers pofterior to Auguftus, if nothing but the ftyle were taken into confideration, would with difficulty be feparated from thofe under Auguftus; but Millin places them accordingly as their works reprefent perfonages that flourifhed in the particular reigns; thus, as contemporary of Tiberius, we have Ælius (ΑΕΛΙΟC), of whom we poffefs the head of that emperor, an excellent engraving, which, however, by fome is confidered as the portrait of Cajus Cæfar.

As contemporary with Caligula, Millin introduces Alpheus and Arethon (ΑΛΦΗΟΣ ΣΥΝ ΑΡΕΘΟΝΙ). There are examples of groups of ftatues being the joint-works of two artifts; but there are no gems engraved by two mafters, except in the prefent inftance: one reprefents Germanicus and Agrippina, which Montfaucon, deceived by the fimilarity of the names, confidered as portraits of Germanicus and Agrippina, in the character of Alphæus and Arethufa. The other of their joint production is the portrait of the fon of Germanicus, the young Caligula. Alphæus has not conftantly affociated himfelf in his works with Arethon: we poffefs of him a mafter-piece of the art, *viz.* the triumph of a barbarian king, drawn in a biga, and crowned by victory. Several other gems with the name of Alphæus are quoted; but their authenticity is not proved. Arethon has not left any work executed by himfelf alone.

The moft eminent engravers of the *time of Titus* are Euodus (ΕΥοΔοC ΕΠοΙΕΙ). There are feveral artifts of this name: the one here mentioned has engraved on a ftone, which is fuppofed an aquamarin, (vide fupra,) the portrait of Julia, daughter of Titus and Marcia, celebrated for her amours with Domitian. The fize and beauty of the ftone, the high finifh of the work, the refemblance of the features, and the fingularity of the coftume, render this gem very remarkable. It is in the collection of gems of the imperial library at Paris.—Nicander (ΝΙΚΑΝΔΡΟΥ): a head of Julia.

The engravers *of Hadrian's time* are: Antiochus (ΑΝΤΙοΧοΥ) a Minerva Bellatrix. A head, fuppofed to be that of Sabina, emprefs of Hadrian, is likewife attributed to him: though this may not be the cafe, yet it appears that it is a portrait of Hadrian's time.—Anteros (ΑΝΤΕΡωC), a Hercules buphagus, according to authors. Millin thinks it is a flave who carries a large calf for a facrifice. It is now in the collection of the duke of Devonfhire.—Hellen (ΕΛΛΗΝ) who has engraved an Antinous as Harpocrates.

Of the engravers of *Marc-Aurel's time* we know;—Aepolianus (ΑΕΡΟLΙΑΝΙ), who has produced a head of Marc-Aurel, which is in the collection of the duke of Devonfhire. M. de la Turbre poffeffes a firft rate intaglio, reprefenting Bacchus intoxicated by the juice of the grape, with the Phrygian cup near him, fufpended from a tree. It is by an artift of the name of Aepolianus, but not the fame with the preceding; for, from the letter ΦΡ added to his name, it would appear that he was a pupil, or fon, of Phrynicus, or Phronymus: nor is it probable that this beautiful engraving fhould be the work of the fame artift who put his name in Roman characters on the buft of Marc-Aurel.

Among the engravers of gems who lived at the *commencement of the decline* of the art, critics have placed a Gauranus Anicetus, who has produced the combat of a dog and a boar; but Millin fuppofes that Gauranus is the name of the dog, and that the infcription fignifies Gauranus the Invincible.

Artifts, of whom the *period* in which they flourifhed *cannot be afcertained*, are the following:—Aetion (ΑΕΤΙωΝ), who engraved the beautiful head of Priam, in the collection of the duke of Devonfhire.—Agametheros (ΑΓΑΘΗΜΕΡΟC). Stofch and Bracci have confidered him as a contemporary of Polycletes. He has produced a fine head of Socrates, which is preferved in the juft mentioned collection. The form of the E not being in the manner of the C, renders the infcription fufpicious.—Allion (ΑΛΛΙΩΝΟC and ΑΛΛΙΩΝ). He has engraved a female guitar-player: if this be intended for a mufe, as is the opinion of Bracci, it muft be a Terpfichore: this will appear from a comparifon between it and the paintings of Herculaneum, and the ftatues of the mufes, in the Mufeo Pio Clementino, now in the Mufée Napoleon, which are probably copied after the celebrated nine produced by Philifcus; but as thefe chafte goddeffes always appear entirely in full drapery, or with a tunic of a fingle fleeve, Stofch is inclined to take the juft-mentioned figure of Allion, as alfo that of Chronius, and of Onefas, for copies

copies of the ftatue which reprefented Sparta. There is likewife a head of Apollo with the name of Allion. Mariette attributed to this artift the famous feal of Michael Angelo, but without any good reafon for doing fo.—Apollodotus (ΑΠΟΛΛΟ ΔΟΤΟΥ ΛΙΘΟ). The head of Minerva. This is the firft engraver, as has been faid before, who added his profeffion to his name. This infcription, by dividing the name into two words, was firft interpreted "Stone given to Apollo;" but it has fince been afcertained that this cannot be the cafe, and that it is the name of the artift. To him is alfo attributed a dying Othryades. His ftyle, fimple, although not excellent, renders it rather probable that he flourifhed before the Auguftan age.—Apollonius (ΑΠΟΛΛΩΝΙΟΥ); a Diana of the mountains (Montium Cuftos), with a torch in her hand.—Afpafius (ΑCΠΑCΙΟΥ); a head of Minerva. The conformity of the engraver's name with that of Afpafia, had, at firft, induced a belief that this portrait reprefented this famous courtefan. This Minerva appears to be a copy from the buft of the Minerva of Phidias: but the form of the letter C, together with the fubftance the artift has employed, namely, a common jafper, is rather againft placing him in one of the flourifhing periods of the Roman empire. There are three engravings of him in the fame red jafper.—Athenion (ΑΘΗΝΙΩΝ); Jupiter thundering at two giants; a fine cameo.—Hyllus (ΥΛΛΟΥ), has engraved a beautiful Dionyfiac bull, a young Hercules, the head of a woman with a diadem, and that of an old man, likewife with a diadem and a long beard. The fimilarity of the bull with that of the autonomic medals of Sybaris may place Hyllus before the age of Auguftus.—Onefas (ΟΝΗCΑC), of whom we poffefs a Leda, a Mufe, and a Hercules crowned with olive.—Philemon (ΦΙΛΗΜΟΝΟC), has engraved a Thefeus, who, having flain the Minotaur, views the body of his enemy proftrate at the entrance of the labyrinth.—Midius produced a fine (but now unfortunately broken) intaglio, preferved in the Mufeum of Antiquities at Paris; the fragment reprefents the combat of a griffin and ferpent.—Mith (ΜΙΘ), perhaps Mithrane, or Mithridate; the head and neck of a horfe. The name is, no doubt, that of the artift; for to fay that the figure reprefents the horfe of Mithridates, and that this gem belonged to his celebrated Dactyliotheca, is conjecturing rather too boldly.—Pamphilus (ΠΑΜΦΙΛΟΥ); his name is on an amethyft in one of the public collections at Paris; it reprefents Achilles playing on the lyre, a fubject which has been repeated by the fame artift: one on a carnelian is in the collection of the duke of Devonfhire: an excellent fculptor, a difciple of Praxiteles, of the name of Pamphilus, is, by fome, fuppofed to be the fame who engraved this ftone; but there is no foundation for this opinion.—Axeochus (ΑΞΕΟΧΟΣ ΕΠ), has engraved a fawn playing on the lyre, near a child holding a thyrfus, with a crefcent between the two figures.—Diphilus (DIPHILI); a vafe with two mafks above the handle. The circumftance that a Greek name is written in Roman characters makes Millin doubt the authenticity of this infcription.—Myrton (ΜΥΡΤΩΝ); a Leda.—Nicomachus; a fawn fitting on a tiger's fkin: in the collection of the duke of Marlborough: the fame figure is feen on a medal of the family Petronia, and is probably a copy of a ftatue.—Pergamus (ΠΕΡΓΑΜΟΥ); a young Bacchante.—Plotarchus (ΠΛΩΤΑΡΧΟΣ); Cupid with the lyre mounted on a lion: the manner of this artift renders it probable that he lived before Auguftus.—Scylax (CΚΥΛΑΚΟC); the head of an eagle; a Hercules Mufagetes, or conductor of the Mufes. Seleucus (CΕΛΕΥΚ); head of Silenus.—Softhenes (CωCΘΕΝ); a beautiful medufa: Stofch and Bracci read CωCΟΚΛΕ, Sofocles; but the infcription is compofed only of the above fix letters, which, according to Millin, fhould be interpreted CΩ ΘΕΝ; the horizontal line of the Θ and Ε frequently wanting in the infcriptions.—Softratus (CωCΤΡΑΤΟΥ); a victory in a biga; a cupid guiding two lioneffes drawing a car. There are feveral other gems with this name; but fome are counterfeits.—Sotratus (CωΤΡΑΤΟΥ); Meleager prefenting Atalanta with the head of the Calydonian boar. Winkelmann conjectures that this and the preceding name may be the fame, and the omiffion of the letter C accidental.—Teucer (ΤΕΥΚΡΟΥ); Jole and Hercules: to judge from the ftyle of this mafter, he might be placed before the Auguftan age.—Apelles (ΑΠCΛΛΟΥ); a fcenic mafk. Bracci has read Apfalus; but, according to Millin, at the period when the C was ufed for the common figma, it was not the cuftom to write ΠC, which two letters were united into Φ. As to the horizontal dafh in Ε, it is often either omitted by the engraver, or too flightly expreffed to be vifible.—Carpus (ΚΑΡΠΟΥ): he has engraved a Bacchus and Ariadne, and a Hercules and Jole.—Euplus (ΕΥΠΛΟΥ); a cupid mounted on a dolphin. The Greek word, inftead of being the name of the engraver, fignifies, perhaps, nothing but "happy voyage."—Euthus (ΕΥΘΟΥ): of this engraver we poffefs a Silen fitting amidft little Cupids that play on the lyre and double flute. M. Millin has concluded his lift of the principal engravers of Greece that flourifhed at periods when they cultivated the art in their own country, and after their fettlement in Rome, with fome general obfervations on the Grecian productions of the glyptic art. It would be falling into an error to fuppofe all thofe productions perfect works of art; for though talent was generally diffufed over Greece, it does not follow that every artift of that country muft have arrived at that pitch of excellence which we admire in many remains of Grecian genius; and, indeed, we poffefs feveral of their engravings that are even beneath mediocrity. Every one, too, appears to have had his peculiar talent; one artift was more fuccefsful in the drapery, another in the reprefentation of the naked body; one excelled in the art of giving expreffion and ftrength, another in giving gracefulnefs to his figures; but the works of the great engravers of Greece, though in different branches of their art, are all ftamped with a peculiar national character, which is better felt than defcribed. Sometimes they gave confiderable depth to their work; at other times we fee their figures wrought in very flight relief, which latter ftyle of engraving is extremely difficult, and its perfect execution conftitutes one of the greateft merits of Diofcorides. In general, the Greeks applied themfelves more to the intaglio, than to the cameo engraving. They were unacquainted with perfpective, the place of which, however, they fupplied in fome meafure, by the greater or lefs depth they gave to the different parts. They did not multiply their figures, or crowd them into a fmall fpace. They were fkilful in reprefenting animals; they preferred to draw the naked body, and, indeed, moft of the mafter-pieces of art produced in Greece are figures without drapery; while thofe executed at Rome are generally richly decked with drapery; with the exception, however, of thofe of Diofcorides, who followed the tafte of his own nation in this refpect, for all his figures, if we except his Mercury, are naked.

The engraved gems of Roman artifts are, in general, very far from meriting the praife which we fo willingly beftow on thofe of the Greeks; their figures, indeed, feldom trefpafs againft the rules of defign; but they are deficient in elegance; they feldom befpeak either genius or elevation of mind in the artift. The tafte for engraved ftones was introduced into Rome with that for other monuments of art; it maintained

maintained itſelf till the time of Septimius Severus, when it began gradually to decline. We ſtill find many heads of Antonius Pius, of Marc-Aurel, or Lucius Verus, but thoſe of Gordianus, Maximinus, and of Philip, are very ſcarce. Lippert, however, mentions a pretty good head of Valerius Probus, and one of Conſtantine II.

Millin claſſes among the Roman artiſts, or at leaſt thoſe that were ſtrangers to Greece, all whoſe names appear to him not of Greek origin, or are written in Latin: the liſt is not a very conſiderable one.

Aquilas (ΑΚΥΙΛΑC); Venus bathing; Cupid preſents a mirror to her.—Felix (ΚΑΛΠΟΥΡΝΙΟΥ CЄΟΥЄΡΟΥ ΦΗΛΙΞ ЄΠΟΙЄΙ); Diomedes carrying off the palladium. Felix was probably a manumitted ſervant of Calpurnius Severus.—Quintillus (ΚVΙΝΤΙΛ.) has given a Neptune on a beryl, or aquamarin.—Rufus (ΡΟΥΦΟΥ, ΡΟΥΦΟC ЄΠΟΙЄΙ); a figure of Ptolemy VIII. or Lathyrus; Aurora driving in a quadriga, and holding a torch in her right hand. The ſame ſubject is repreſented on a medal of the family Plautia, with a maſk on the reverſe, in memory of Plautus Rufus, who recalled to Rome the flute players that had withdrawn to Tibur. A great number of gems, with Roman names, are mentioned; but they are probably the names of the proprietors, not thoſe of the engravers of the ſtones.

The celebrated dog Sirius, attributed to Cajus (ΓΑΙΟC) in the collection of the duke of Marlborough, is generally quoted as the work of a Roman artiſt; but Raſpe is of opinion, that the name is fictitious, and that this valuable gem is the work of Natter, who executed it at Florence, for Baron Stoſch. If ſo, this is one of the moſt remarkable inſtances of reſignation.

It has been aſſerted, that the engraver of the head of Marc-Aurel is the laſt who has added his name to his works; but, to judge from the execution, the form of the letters, the orthography, thoſe who have written their names on the following ſtones, have, according to M. Millin, probably flouriſhed in the Lower Empire.—Of Chæremon (ΧΑΙΡΗΜΩΝ) we poſſeſs the head of a fawn.—Phocas (ΦΟΚΑC); a pugiliſt with a veſſel at a diſtance.—Nicephorus (ΝΙΚΗΦΟΡΟC); a Mercury, with his uſual attributes, and carrying on his right hand the eagle of Jupiter. One of the more remarkable works of this period, is the ſtone called the *ſapphire of Conſtance*, which formerly belonged to the muſeum of France, and was not long ſince in the collection of the marquis Fulci-Rimiccini at Florence: it repreſents the emperor Conſtance attacking a wild boar, near Cæſarea, in Cappadocia.—Amphoterus (ΑΜΦΟΤΕΡΟΥ): we have of him a head ſaid to be that of Rhoemetalces, king of Thrace, but the ſuppoſed reſemblance has not been proved.—Ammonius (ΑΜΜΟΝΙΟΥ); a head of a fawn, an excellent engraving.

Of the ſcanty production of art, during the middle ages, ſeveral Greek works have been preſerved, repreſenting various ſubjects of the Old and New Teſtament, with long Greek inſcriptions: ſuch is the ſardonyx publiſhed by Gori as a frontiſpiece to his "Theſaurus veterum Dyptichorum." Several gems of this time are diſtinguiſhed for the ſize of the onyx in which they are engraved. We find, particularly in the Eaſt, at Conſtantinople, engravings very near the period of the greateſt barbariſm; an advantage it owed to the art of coining, which could not be practiſed without the aſſiſtance of that of engraving. But in the Weſt, the latter diſappeared at an early period, ſo that ſcarcely a trace of it remained. The Chriſtian religion having ſpread all over Europe, the ancient engraved ſtones were no longer ſought after, as repreſenting objects of worſhip; they were only occaſionally uſed as ſeals. Pepin ſealed with an Indian Bacchus; Charlemagne with a Serapis. Soon after their uſe for ſealing was diſcontinued; they were no longer ſet in rings, they diſappeared, were diſperſed, buried; they were employed for ornamenting the ſhrines in the churches, and it was in this manner that many of the highly valuable antique gems were preſerved to poſterity.

The engravings on ſtone, of thoſe times, offer ſcarcely any thing except pious ſubjects, images of Chriſt, or the Virgin, or ſimply their monograms. Sometimes we ſee on them a ſmall fiſh, called in the Greek language, ΙΧΘΥΣ, a word, the letters of which become the initials of Ιησους Χριςος Θεου υιος; often they repreſented the good ſhepherd, and other ſubjects of the Old and New Teſtaments.

The moſt celebrated engraved ſtones among the intaglios, with the names of the artiſts enumerated in the preceding part of this article are, the Io, the Demoſthenes, the Perſeus and Mercury of Dioſcorides, the bull of Hyllus, the Hercules of Onejus, the Meduſa of Solon, the Julia of Evodus, &c. One of the moſt famous of thoſe that are without the names of the artiſts, is the ſeal of Michael Angelo, a carnelian preſerved in the Imperial library at Paris, and thus called from having belonged to that celebrated painter. It ſimply repreſents a vintage, but has been the ſubject of much conjecture, and many diſſertations have been written on it. Mautour diſcovers in it ſacrifical rites in honour of the birth of Bacchus; according to Tournemine, it is Alexander repreſented as Bacchus, and the whole relates to the conqueſt of India; but, according to Roſman, it is the birth and education of Alexander. Baudelot and Thierheim conſider it as a repreſentation of an Athenian religious proceſſion. Mariette ſees nothing in it but a vintage, and the little fiſherman in the exergue, according to him, is intended to expreſs the name Allion, the engraver. Von Murr however, has proved that it is the work of Maria di Peſcia, a celebrated modern artiſt and friend of Michael Angelo, and that the figure of the little fiſherman in the exergue alludes to his own name. This ſtone has been often copied, and there are a great number of impreſſions from it. Other diſtinguiſhed intaglios are, a young Hercules, and a Hercules veiled like a Lydian woman, both in one of the public collections of Paris, five chiefs before Thebes, &c. &c. Among the gems in relievo called cameos the moſt remarkable are, the ſardonyx of Tiberius, and the ſardonyx that formerly belonged to the emperor of Auſtria; with ſome others mentioned above. Beſides theſe large cameos, there are in ſome cabinets moſt valuable ſpecimens of thoſe cups called *gemmæ potoriæ* by the Romans. They are generally of ſardonyx. The moſt celebrated are the ſuperb cup repreſenting the myſteries of Ceres and Bacchus given by Charles III. to St. Denis, and now in the collection of antiquities of Paris; the Brunſvick vaſe of ſardonyx, ſo often deſcribed, which repreſents the hiſtory of Ceres in ſearch of Proſerpine, and that of Triptolemus, and which originally belonged to the family Gonzaga, but was ſtolen at the ſacking of Mantua in 1630 by a ſoldier, who ſold it for 100 ducats to the duke of Brunſwick; this wonderful work of art is now likewiſe at Paris. But the moſt ſuperb of all the engraved vaſes is the Portland, or Barberini vaſe, which was firſt in the collection of the Barberinis, from whence it came into the poſſeſſion of the duke of Portland, and is now depoſited in the Britiſh Muſeum. One of the firſt Italian engravers of the fifteenth century was Giovanni delle Cargniole, whoſe reputation as an engraver of intaglios procured him this name; we poſſeſs of him, among others, the portrait of Savanarole.—Dominichino, ſurnamed de' Camree, becauſe he excelled in the execution of raiſed work, has engraved the portrait of Luigi Sforza.—Michelino, Marco de Benedetti, Marco, Attio, Moretti, Franceſco Francia, Leonarde di Milano, and Severo di Ravenna, likewiſe ac-

 quired

quired great celebrity as artifts. Tagliacarne probably took this name on account of his fkill in engraving carnelians.—Foppa furnamed Caradoffe.

The lift of the Italian engravers of the fifteenth century is much more numerous; this is the moft flourifhing period of modern glyptic art, and indeed that century produced feveral worthy of the ancient mafters to whom they looked as their models. The principal among them are, Pietro-Maria di Pefcia, in Tufcany, a zealous admirer of the ancients, and their faithful imitator. This is the artift whom Von Murr believes to have executed the celebrated feal of Michael Angelo.—Giovanni Bernardi and Caftel Bolognefe; the latter has engraved many cryftal cups and ftones for cardinal Farnefe; he died in 1557. Of him we poffefs a beautiful engraving reprefenting Tityus, whofe liver is devoured by a vulture, executed after a defign of Michael Angelo for cardinal Hippolito de' Medici. M. Collet owns a magnificent cameo, the work of this great artift, which reprefents the head of St. John decapitated.—Matteo del Naffaro born at Verone, follows Francis I. into France where he diffufed the tafte for his art. The Mufeum Napoleon, and the Cabinet of Antiquities of the library at Paris, poffefs feveral of his works. One among them reprefents a battle, and on one of the colours we fee the letters O. P. N. S. (Opus Naffarii Sculptoris). He died in 1547.—Giovanni Giacopo Caraglio of Verona, engraver of ftones, medals, and of copper plates.—Valerio Vicenlino, called by fome Valerio Belli. Mariette, (Traité, p. 46.) has publifhed his portrait. This is one of the moft capital and laborious artifts in his department. He has engraved various fubjects taken from Roman hiftory; he died in 1546.—Aleffandro Cefari, furnamed Il Greco, on account of his imitating the ftyle of the great mafters of Greece. We have of him a beautiful portrait of Henry II. king of France.—Giacopo da Trezzo, to whom the firft engraving on diaomnd is attributed. The cabinet of Antiquities at Paris poffeffes of this mafter the portraits of Philip II. and Don Carlos on a Brazil topaze. He died in 1587.—Clemente di Birague, who is likewife faid to have executed engravings on diamond.—Annibale Fontana, known by feveral works on rock cryftal.—Santa Croce, called Pippo, originally a fimple fhepherd, who engraved on cherry ftones the moft delicate bas-reliefs. Filippo Doria, who met with him in the duchy of Urbino, placed him under proper tuition, and affifted him in fettling at Genoa.—Antonio Dordoni; died at Rome in 1584;—and Flaminio Natalis, in 1596.

The art of engraving, fo flourifhing in Italy in the fixteenth, loft much of its fplendour in the feventeenth century; nay, it was fo little cultivated, that feveral proceedings and mechanical advantages were entirely loft, fo that the celebrated artifts of the eighteenth century were obliged to invent others. The moft diftinguifhed Italian engraver of ftones in the feventeenth century is Andrea, furnamed Il Borgognone; he engraved about the year 1670. The others are Adoni Taddeo, Caftrucci, Antonio Mochi, Juliano Pericioli, and a few more. For the confervation of the art in that century, we are principally indebted to Ferdinand II., who continued and added to the penfions given to the artifts then engaged to work in the gallery of Florence.

The eighteenth century has given artifts to Italy, whofe names are worthy to be mentioned together with the Pyrgoteles, Solon, Aulus and Diofcorides. Moft of them were fettled at Florence.—Flaviano Sirletti, who died in 1737, has copied feveral greek works. He excelled in the imitation of ancient letters: his works are marked Φ. Τ. Σ. ΦΛΑΒΙΟΥ ΤΟΥ ΣΙΡΛΕΤΟΥ. Others worthy to be mentioned are the Coftangis, Giovanni, Tomafo, and Carlo his fon; Domenico Landi; Francefco Ghinghi; Jeronimo Roffi; Stefano Paffalia; Francefco Borghighiani; Felice Barnabee, the Torricellis; Lorenzo Mafini. Thofe gem engravers who at prefent cultivate their art with greateft fuccefs, are Sign. Santarelli, Maffini, and Capperoni; at Naples, Sign. Rega, an artift, fome of whofe productions may be compared with thofe of antiquity. There is alfo a female artift of note in that city, Signora Talani of Rome.

The German engravers of gems have always maintained the firft rank after thofe of Italy. The oldeft German engraver on ftones is Daniel Engelhard of Nuremberg, who died in 1552; he is, however, not known to have executed more than arms and crefts.—Chriftopher Schwaiger has been called the German Pyrgoteles, but none of his engravings are afcertained. There is a portrait of him with the year 1620 on it.—George Hoefler; he died in 1630.—Eberhard Dorfch, who died 1732: Rafpe thinks the greateft part of the pretended antique gems that were in the cabinet of Mr. Ebermeier at Nuremberg are by Dorfch.—Philip Chriftoph. de Beiker, died in 1743: an artift of great merit, as is proved by his buft of Charles VI., and other engravings.—Marc Tufcher, a good painter, but of whofe engravings on ftones Mariette is far from fpeaking favorably. The fact is, Tufcher exercifed that art merely as an amateur.—Anton Pichler, the father of the celebrated John Pichler; he was a native of Brixen in Tyrol, and has produced fome engravings of merit.—John Pichler, who is claffed by Millin with the Italian fchool of engravers, becaufe he fpent a great part of his life, and is faid to have formed his tafte in Italy, is unqueftionably one of the greateft glyptic artifts of modern times. He has produced a great number of excellent engravings, feveral of which may be compared with the more celebrated productions of ancient arts.—Lorenz Natter, a native of Suabia; his numerous works befpeak a refined tafte, and are executed with the greateft delicacy and correctnefs in the defign. He was, at the fame time, a great proficient in the theory of his art, and his "Traité de la Méthode Antique de Graver en Pierres Fine," is the only work we poffefs on this interefting fubject. He died in 1763.—Krafft from Dantzick, a good engraver, fettled in Rome at the time of Mariette, who calls him Graaft, and fays that the difficulty of pronouncing his name occafioned his being called "il Tedefco" by the Italians; but Rafpe obferves that it is, or was, a general cuftom among Italian artifts, to call each other by their chriftian names, or by the name of their country. He was a pupil of Natter. Other modern German engravers are Hubner of Drefden; Lerter, and Aaron Wolf; the laft-mentioned artift, a native of Brandenburg, is of the Jewifh perfuafion, and fettled at Leghorn; we have of him a Leda which has rendered his name celebrated.

Among the Englifh engravers of gems, efpecially thofe of more modern times, there are feveral who have acquired great reputation by their works, fuch as Dean, Wray, &c. and a Burch and a Marchant have attained to a degree of excellence which would have been acknowledged and refpected in the beft periods of ancient art. In general, however, the number of good engravers on ftones has not been very great in this country.

The firft, and perhaps the only engraver of fome note in France, after Matteo de Naffaro had in the time of Francis I. introduced into that country the tafte for the glyptic art, was Coldoré, who lived at the end of the fixteenth century, till the reign of Louis XIII. Whole figures are not known to be engraved by this artift; but his heads are remarkable for their elegance, the firmnefs with which they are executed, and their perfect refemblance to the originals. It is faid, that queen

queen Elizabeth invited him to ſettle in England; there was a beautiful cameo repreſenting this queen, in the cabinet of the duke of Orleans, which Mariette thinks can be the work of no other artiſt but Coldoré. The ſame author is of opinion, that Julien de Fontenay and Coldoré were no rivals, as it has been ſuppoſed, but one and the ſame perſon under different names.—Maurice, a native of the Netherlands, and a good engraver, ſettled at Rouen, where he died in 1732, aged 80.—François Julien Barrier, died 1746.—Louis Siries, who was employed in the gallery at Florence. His merit conſiſted in crowding a great number of figures into a ſmall ſpace. Giulianelli is very high in his praiſe; but Natter conſiders his engravings as devoid of all merit.—Jacques Guay of Marſeilles, has ſucceſsfully practiſed the art: there are, in the cabinet of antiquities in Paris, a ſeries of engravings executed by him for Louis XV. - France, which at no time excelled in the number of good gem engravers has, ever ſince Guay's time, been particularly deficient in this claſs of artiſts, ſo that Millin (in 1797) conſidered the glyptic art as abſolutely extinct in his country. There is, however, at the preſent day, a ſkilful engraver in Paris of the name of Jeuffroy, whom the national inſtitute has thought worthy to receive among its members.

Thoſe antique engraved ſtones, that bear the name of the artiſt, having at all times been looked upon as particularly intereſting and valuable, ſeveral perſons have fraudulently availed themſelves of this circumſtance to add the name of ſome celebrated engraver of antiquity to works both of ancient and modern art; and ſome of them have ſucceeded ſo well, that often much critical acumen is required to detect the deception. Natter himſelf is accuſed of having lent himſelf to this ſpecies of fraud in compliance with the commands of his employers. The artifice of thus putting the name of ſome celebrated artiſt to an engraving, is, however, not peculiar to modern times; it was already practiſed at the time of Phædrus, who complains of it in one of his fables. We ſhould not, therefore, conſider ancient names on gems as genuine, before the ſevereſt criticiſm has proved them to be ſo. The following rules may aſſiſt in diſcovering their authenticity. The beauty of the work ſhould be proportionate to the talent of the artiſt to whom it is attributed: a middling engraving, though it bears the names of Pyrgoteles, Cnejus, Solon, Aulus, or Dioſcorides, cannot reaſonably be attributed to any one of thoſe great maſters. The great ancient artiſts have in general engraved on the finer kind of ſtones; hence the name of Dioſcorides on a common jaſper muſt excite ſome doubt as to the authenticity of the name; there is, however, by way of exception, a very beautiful work of Aſpaſius in red jaſper. The form of the letters is likewiſe of great utility in diſtinguiſhing truth from impoſition. Thoſe of the early ages are leſs perfect than thoſe of the engravers of the Auguſtan age, which are elegant and highly finiſhed; whence the name of *Dioſcorides*, written in an unequal manner, can ſcarcely be the work of this great maſter; for the celebrated artiſts, jealous of their reputation, even with regard to the minutiæ of their art, did not truſt others with the execution of the letters. The inſcriptions on engraved ſtones, particularly thoſe of the Auguſtan age, are generally terminated by ſmall round dots, very equal in their proportions, intervals, and depth. Peireſcius was of opinion that they might have been intended for the reception of minute pins, for the ſake of faſtening the gold, with which he ſuppoſed the hollow characters were filled up; but nothing proves that theſe inſcriptions were intended to be filled up with a metal: they are cut in the ſtone in order to expreſs in reliévo the name, together with the image. At the preſent day moſt antiquaries agree in ſuppoſing theſe dots to have been deſtined to mark the diſtances of the letters, and to give greater regularity to them, juſt as we obſerve ruled lines in old manuſcripts. In the ſame manner medals have the letters of the inſcription terminated by round dots; and, from the frequency with which they occur on them, it is probable that what was firſt calculated to produce uniformity, was afterwards adopted as ornament. The form of the letters may likewiſe ſerve to diſcover fraud. The mixture of Greek with Latin letters is an evident ſign of forgery. The ſame may be ſaid of a letter expreſſed in two different ways in the ſame word; for inſtance, the ſigma written as C, and as Σ in the word COΣTPATOC. Such errors are commonly committed by modern artiſts, who undertake to add the names of ancient maſters to their works; they are generally indifferent grammarians, and, therefore, liable to commit errors, which no artiſt of antiquity could have fallen into. Thus deceived by the prnounciation of the name, they have written ΔIOCKOPIΔOY inſtead of ΔIOCKOYPIΔOY; they add a letter in one name, and omit one in another. If an artiſt is known to have been accuſtomed to add his name in the genitive caſe, as it was done by Dioſcorides, an engraved ſtone, on which the ſame occurs in the nominative caſe, muſt always excite ſuſpicion. In general the names expreſſed in the nominative caſe are rare. If we read AYΛOY, ΔIOKOYPIΔOY, ΠAMΦIΛOY, the word ἔργον is to be ſupplied, *i. e.* the work of Aulus, Dioſcorides, &c. If the name be in the nominative caſe, it is the verb which is omitted, whence ΔIOCKOYPIΔHC implies the word ἐποίει, Dioſcorides faciebat. Where two names occur in the ſame caſe, the one is the name, and the other the ſurname; but where the firſt name is put in the genitive and the ſecond in the nominative caſe, this indicates that the artiſt was the ſon, the pupil, or the freed ſervant of him whoſe name is put in the genitive caſe. Thus, EYTYXHC ΔIOCKOYPIΔOY ſignifies either that Eutyches was the ſon or pupil of Dioſcorides, or perhaps both the one and the other. But in the inſcription on a ſtone repreſenting Diomedes carrying off the palladium, KAΛΠOYPNIOY CEOYHPOY ΦHΛIΞ EΠOIEI, (Calpurnii Severi Felix faciebat,) it is very probable that this Felix was the manumitted ſervant of Calpurnius Severus, and though theſe names are Roman, yet as he makes uſe of Greek letters, he likewiſe adopts the form of the Greek ſtyle. An engraving on a ſtone is ſometimes the joint work of two artiſts. Alphæus and Arethon have produced a gem with the inſcription AΛΦHΩC CYN APEΘΩNI (Alphæus with Arethon). We have but one ſingle inſtance of an engraver who with his name has indicated his profeſſion on the gem, and this is Apollodotus; by the ſide of the head of Minerva we read AΠOΛΛOΔOT. ΛIΘO, (Ἀπολλοδότου λιθογλυφου sc. ἔργον,) or the work of Apollodotus the engraver). The greateſt part of the names of engravers are Greek. In one inſtance, perhaps, the artiſt has added the name of his native country; for on a ſtone repreſenting the cap of Caſtor between two ſtars, we read AΠOΛ ΣMYP, which is explained Apollonides of Smirna; but it is probable that this engraving is votive, and that, inſtead of the name of the artiſt, it bears that of the navigator, who hoped by this taliſman to obtain a fortunate voyage from the ſons of Leda.

The names of Roman engravers are, for the greateſt part, written in Greek letters, while there are very few inſtances of Greek names being written in Latin characters; and even theſe few inſtances cannot be conſidered as of great authority. In general it may be ſaid that the Etruſcan gems bear the name of the perſonages repreſented on them; for inſtance, thoſe on which are cut the names of Peleus, Tideus, the five Theban chiefs, &c. The engraved ſtones of the Greeks, on the other hand, bear the name of the artiſt, and

 thoſe

thoſe of the Romans ſometimes the name of the engraver, ſometimes that of the owner. This cuſtom, of adding the name of the poſſeſſor, has been preſerved in more modern times, particularly in the cinque cento, the ſixteenth century; witneſs the many antique gems with the inſcription LAUR. MED. (Lorenzo de' Medici) which Maffei has in vain endeavoured to explain. Not ſeldom the names of modern engravers are written in Greek characters, ſuch as Φ. Τ. Σ. ſignifying Φλαβιȣ τȣ Σιρλετȣ, or Flavio Sirleti; ΠΙΧΛΗΡ, Pichler, &c. Thoſe amateurs only, that are unacquainted with the Greek alphabet, are liable to be deceived by this practice. Other artiſts have concealed their name, a kind of literal tranſlation of its import; Winkelmann and Büſchiny have taken the word ΥΔΡΟϹ (Hydros,) for the name of a Greek engraver, while it is nothing but a tranſlation of *Natter*, which German word ſignifies a viper, called hydros by the Greeks. We may alſo, in ſome meaſure, determine the period in which the engraver of a particular gem lived, by finding out the time when his name was moſt common: thus, for inſtance, the name of Zoſimus, more common in the Lower Empire than in any other period, will, with ſome probability, indicate that period to be the date of the work in queſtion. Some engravers, undoubtedly very well known at the time when they flouriſhed, have put nothing but the initials of their names, which neceſſarily muſt be filled up in an arbitrary manner; and this difficulty increaſes, if the name ſignifies at the ſame time the object repreſented, and therefore leaves us doubtful whether we are to apply it to the object, or to the artiſt. Thus the letters HERM, on a carnelian repreſenting Mercury, may be intended for Hermes, or for the name of an artiſt ſuch as Hermotime, Hermolaus, &c. The modern engravers that have been moſt ſucceſsful in copying the names of ancient artiſts, are Flavian Sirleti, Natter, and Pichler.

The *mechanical part* of the *art of engraving gems*, ſuch as it was practiſed by the ancients, differed in no reſpect from the method which is followed by the engravers of the preſent day; for, according to the opinion of a competent judge in theſe matters, the celebrated Natter, (the reſults of whoſe reſearches are publiſhed in a treatiſe entitled "De la Méthode Antique de Graver en Pierres fines, comparée avec la Méthode Moderne)," their tools were not only analogous to thoſe of modern artiſts, but they uſed them exactly under the ſame circumſtances. It is not our intention to follow the juſt-mentioned ingenious artiſt in the analyſis he has given of a number of antique engravings, but we ſhall copy one of the heads repreſented in the above work, together with an outline drawing of the ſame head, which exemplifies the mode of proceeding employed by the engraver of ſtones. Theſe figures, together with thoſe repreſenting the lathe and tools uſed by the gem engraver, will ſuperſede a more detailed deſcription than the one which we are enabled to give in this place.

The firſt operation of the engraver is to give to the ſtone that is to be employed a form ſuitable to the ſubject he intends to repreſent on it. This is generally performed by the lapidary. (See LAPIDARY.) He next draws the outline of the ſubject with a braſs needle, or a diamond, on the poliſhed ſtone, which is cemented by means of maſtich to a handle of wood for the purpoſe of moving it more commodiouſly in all directions.

Fig. 1. (*Plate* XVIII. *Miſcellany*) repreſents the whole of the lathe; it conſiſts, as the figure ſhews, of a table, on which is fixed the mill, or a ſmall horizontal cylinder of ſteel, at one of whoſe extremities the tool is inſerted, and which is turned by means of a vertical wheel below, communicating with the horizontal cylinder by means of a cord, and ſet in motion by the foot of the artiſt. Sometimes the whole of the mill on that ſide, except that part of the cylinder to which the tools are fixed, is covered by a cap; but this is not always made uſe of.

The tools that are alternately fixed to the extremity of the mill, are,

Fig. 2. a hollow cylinder made uſe of to deſcribe circles with facility, and alſo for perforating.

Fig. 3. is the knobbed tool, called *bouterolle* by the French; it is employed in various kinds of work; for extremities, &c.

Fig. 4. a tool, the upper part of which is in the form of a ſmall diſk rounded at the edge: it is uſed for various purpoſes.

Fig. 5. a ſimilar tool, but with diſks not rounded at the the edge.

Fig. 6. the ſame, but with the edge of the ſmall diſk, ſharpened for the purpoſe of cutting into the ſtone: it is called in French *ſcie* (ſaw).

The ſize of theſe tools varies from the bigneſs of a large pea, to that of a point ſcarcely viſible to the naked eye.

It is obvious that theſe tools may be varied in their form, according to the fancy of the engraver; but thoſe juſt deſcribed are moſt generally made uſe of.

When the tool is fixed in the manner above deſcribed, and repreſented in the figure, the artiſt applies to its point diamond-powder, mixed up with olive oil; he then turns the lathe, and begins his work, by bringing the ſtone faſtened to a piece of wood, into contact with the tool which turns round its axis with conſiderable velocity.

Fig. 7. repreſents a ſtone of convex ſurface, with a tool applied to it; it ſhews the advantage of working on ſtones of that form; for the ſpace between the ſtone and the tool being more conſiderable in a convex than in a plane ſtone, the tool penetrates farther on the former than it would on the latter. This may be ſeen by fig. 8, where the ſame tool touches much nearer the borders of the flat ſtone.

Fig. 9. The ſtone applied diagonally to the tool produces what the Italians call *ſotto quadro*; engravings made in this manner cannot give a good impreſſion.

There are ſome figures which are with difficulty executed on ſtone, although they appear eaſy; and others that appear difficult, although they are far from being ſo. Thus, for inſtance, figs. 10, 11, 12, repreſent different angles, which it is no eaſy matter to execute with nicety; we generally obſerve imperfect execution in ſuch angles, where the round tool cannot be made to touch.

Fig. 13. is a hexagon, which may be engraved without difficulty, ſince all its points correſponding by two and two, nothing is required but to trace three lines, croſſing each other in a common centre. Another difficulty there is with regard to the letters, which cannot be executed in the manner of thoſe that are ſeen on medals (ſee fig. 17.); the tool will always leave ſome imperfection in the angles of the extremities, as appears in fig. 14 and 15. The beſt engravers of antiquity have preferred to make uſe of the bouterolle to mark the termination of the letters and ſeveral other objects.

The head of Jupiter Serapis, repreſented figs. 16, 17, and 18, is given by Natter, as an example of the mode of proceeding, in order to produce a work of that deſcription.

A ſtone is to be procured, cut into an oval form, convex above, ſuch as fig. 18. It matters little, whether its baſe is flat or convex, provided it be of ſufficient thickneſs to bear the engraving. Being fixed to a handle, as above deſcribed, the engraver begins his operation by excavating, with a ſemicircular tool, an oval of the ſize of the head in queſtion; but leſt this operation ſhould produce a round figure inſtead of an oval, the ſtone is to be gradually moved in the direction

of

of its greater diameter. This is continued till the oval is of fufficient depth, to begin the eyes. See fig. 18. *a*.

You may proceed in a longitudinal direction upwards, as far as to the middle of the *modium* on the head, expreffed by the upper end of the dotted line *a* ; and downwards as far as to the middle of the neck. The breadth of the oval is to be made in proportion.

This being done, you may work out the place for the hair, which, in order to imitate the original, fig. 16, fhould be more projecting on the one than on the other fide. The beard may be marked with the fame tool as far downwards as *b*, fig. 18, and fideways as far as *b*, fig. 17. After this the tool is changed for a fmaller one to mark the forehead *c*, as alfo the modium ; and, in order to avoid the unneceffary fhifting of tools, the fhoulders may be begun upon with the fame tool.

The foundation being laid in this manner, a narrower tool is taken, which is a little rounded, and whofe fize is adapted to the length of the nofe of the portrait ; with this the form of the nofe, cheeks, and neck are engraved in ftraight lines. See letter *d*, figs. 17 and 18.

After this a fmall tool is required to crofs the top of the nofe, by which means the noftrils are formed ; with it alfo the eyes are fketched, and the principal locks of hair. (See *f*. figs. 17 and 18.) Laftly, the knobbed tool is ufed to produce the rounded tip of the nofe, which is to be brought into unifon with the other parts already fketched. (See *g*, figs. 17 and 18.)

When the figure is fo far executed, fmaller and more cutting tools are employed to finifh it ; for which latter operation depending entirely on the fkill of the artift, no rules can be laid down.

In order to give the higheft degree of polifh to the engraving, boxwood, pewter, or copper tools with moiftened tripoli or rotten-ftone, and laftly a brufh, are faftened to the mill, and fet in motion in the fame manner as the tools ; the ftone being brought into contact with them. The modern engravings have not nearly the fame high polifh as moft of thofe of antiquity.

It is obvious, that before fuch a work can be entered upon, the engraver muft be able to defign and model the head in its juft proportions, either in wax or clay ; for without fuch preparation no engraving can be expected to fucceed. *Unexperienced* beginners, in copying the model, will often engrave lefs prominent parts before the more projecting are wrought fufficiently deep, the confequence of which is, that they are obliged to deftroy a work fo injudicioufly commenced. An inconvenience of another nature arifes from working too deep in the beginning ; for in this cafe, in order to preferve the work, it will afterwards be required to have the ftone ground down by the lapidary. It is, therefore, better to proceed flowly and with caution, which enfures fuccefs, than, by hurrying, run the rifk of lofing your labour and of deftroying the ftone.

On examining this head of Jupiter Serapis, which is not a work of great merit, it will be feen that the engraver has been obliged to trace at the left fide of the head a lock of hair of greater breadth than appears neceffary for juft proportion : the reafon for doing fo was, that without it he could not well have finifhed the fmall parts, fuch as the eyes, the nofe, mouth, &c. ; whereas, having procured more room by this excavation, he found himfelf enabled to enter with the fmaller tools, and to finifh his engraving according to the fhare of fkill he poffeffed.

GEMS, *Impreffions of*. See IMPRESSIONS.

GEMAAGIDID, or DELGUMUTU, in *Geography*, a town of Morocco ; 40 miles S. W. of Morocco.

GEMAPPE. See JEMMAPE.

GEMARA, or GHEMARA, the fecond part of the Talmud. The word נמרה, *gemara*, is commonly fuppofed to denote a fupplement ; but, in ftrictnefs, it rather fignifies complement, perfection : being formed of the Chaldee גמר, *gemar*, or *ghemar*, *to finifh*, *perfect*, or *complete* any thing.

The rabbins call the Pentateuch, fimply, the law. The firft part of the Talmud, which is only an explication of the law, or an application thereof to particular cafes, with the decifions of the ancient rabbins thereon, they call the Mifchna *i. e.* fecond law ; and the fecond part, which is a more extenfive and ample explication of the fame law, and a collection of decifions of the rabbins pofterior to the Mifchna, they call Gemara, *q. d.* perfection, completion, finifhing ; becaufe they efteem it the finifhing of the law, or an explication, beyond which there is nothing farther to be defired.

The Gemara is ufually called, fimply, Talmud, the common name of the whole work. In this fenfe we fay, there are two Gemaras, or Talmuds ; that of Jerufalem, and that of Babylon : though, in ftrictnefs, the Gemara is only an explication of the Mifchna, given by the Jewifh doctors in their fchools ; much as the commentaries of our fchool divines on St. Thomas, or the mafter of the fentences, are an explication of the writings of thofe authors.

A commentary, M. Tillemont obferves, was wrote on the Mifchna by one Jochanan, whom the Jews place about the end of the fecond century ; but as it is generally believed that the Mifchna was not written till towards the clofe of the fecond century, the Gemara muft have been compiled at a later period. Accordingly this Gemara is fuppofed to have been the production of fome period between the years 300 and 400. Indeed, the Jews themfelves confefs that the Gemara of Babylon was fubfequent to the Mifchna about 316 years. But a great difference of opinion prevails among the learned, concerning the time when the Mifchna was written, fome referring it to the end of the fecond century, others to the end of the fourth, or end of the fifth, or beginning of the fixth century. Wolfius obferves, in his preface to his "Bibliotheca Hebræa," (p. 28.) that the Jews affirm the Mifchna to have been written 316 years before the Gemara of Babylon, and that the Jerufalem Gemara was 83 years before the other Gemara. See MISCHNA. But F. Morin argues from the work itfelf, wherein mention is made of the Turks, that it was not written till the time of Heraclius, or about the year 620 ; and this is what is called the Gemara, or Talmud of Jerufalem, which the Jews do not ufe or efteem much, becaufe of its obfcurity.

They fet a much greater value on the Gemara, or Talmud of Babylon, begun by one Afa ; difcontinued for feventy-three years, on occafion of the wars with the Saracens and Perfians ; and finifhed by one Jofa, about the clofe of the feventh century. See TALMUD.

Though the name Talmud, in its latitude, includes both the Mifchna and the two Gemaras ; yet it is properly that of Afa and Jofa, alone, which is meant under that name. This the Jews prize above all their other writings, and even fet it on a level with fcripture itfelf ; in effect, they conceive it as the word of God, derived by tradition from Mofes, and preferved, without interruption, to their time. R. Jehuda, and afterwards R. Jochanan, R. Afa, and R. Jofa, fearing the traditions fhould be loft in the difperfion of the Jews, collected them into the Mifchna, and the Gemara. See CARAITES and RABBINISTS.

GEMATRIA, or GAMETRIA, the firft kind of artificial cabbala ufed by the Jews.

The word is formed from the rabbinical Hebrew גימטריא, formed by corruption of the Greek.

Gematria is a geometrical or arithmetical method of explaining words, whereof there are two kinds; the firſt bearing a more immediate relation to arithmetic, and the latter to geometry.

The firſt conſiſts in taking the numerical value of each letter in a word or phraſe, and giving it the ſenſe of ſome other word, whoſe numerical letters, taken after the ſame manner, make the ſame ſum. For it is to be obſerved, that neither the Hebrews, nor the Greeks, have any numerical figures, beſides the letters of the alphabet.

Thus, a cabbaliſt, taking the two firſt words in Geneſis, בראשית ברא, and by addition getting the ſum total of all the numbers, ſignified by thoſe letters, finds that theſe two words ſignify the ſame as thoſe other three, בראש-השנה-נברא. For as to the firſt, ב is 2; ר, 200; א, 1; ש, 300; י, 10; ת, 400; ב, 2; ר, 200; and א, 1; which, together, make 1116. And, as to the latter, ב ſignifies 2; ר, 200; א, 1; ש, 300; ה, 5; נ, 50; ש, 300; ה, 5; נ, 50; ב, 2; ר, 200; and א, 1 which, ſummed up, yield the ſame number 1116.

Whence the cabbaliſt concludes, בראשית־ברא, *in the beginning he created,* ſignifies the ſame thing as בראש השנה-נברא, *it was created at the beginning of the year:* and, accordingly, the received opinion of the cabbaliſts is, that the world was created at the beginning of the month Tiſri, which was anciently the firſt month in the year, and anſwers to our firſt month in autumn, *viz.* September.

So, again, in the prophecy of Jacob, Gen. xlix. 10. the words יבא שילה, are underſtood of the Meſſiah, becauſe they make the ſame number with משיח, which ſignifies the Meſſiah.

The ſecond kind of Gematria is much more obſcure and difficult; and, accordingly, is leſs uſed. It is employed in ſeeking for abſtruſe and hidden interpretations, in the dimenſions and parts of the buildings mentioned in ſcripture, by dividing, multiplying, &c. thoſe meaſures by each other. Of this we ſhall give an example from ſome Chriſtian cabbaliſts.

The ſcripture ſays, that Noah's ark was 300 cubits long, 50 wide, and 30 high: now the cabbaliſt takes the length for the baſis of his operations; 300, in the Hebrew, is expreſſed by the letter ש, which length, divided by the height 30, gives the quotient 10, the Hebrew character whereof is י; this is to be placed on the right ſide of ש: he then divides the ſame length by the width, 50, the quotient whereof, 6, is expreſſed by a ו, which, being placed on the left ſide of ש, makes, together with the other two letters, the name Jeſus, ישו. Thus, by the rules of the cabbala, it appears, that there is no ſalvation but in Jeſus Chriſt; as, at the deluge, no perſon was ſaved but thoſe in the ark.

After the like manner is the ſame name ישו found in the dimenſions of Solomon's temple. But it is rather an injury than an advantage to the Chriſtian religion, to ſupport it by ſuch frivolous evidences.

GEMBICZ, or Gembock, in *Geography,* a town of the duchy of Warſaw; 16 miles E. N. E. of Gneſna.

GEMBLOUX, Gemblours, or Giblou, a town of France, in the department of the Sambre and Meuſe, and chief place of a canton, in the diſtrict of Namur, ſituated on the ſmall river Orneau, which runs into the Sambre; 10 miles N. W. of Namur. The place contains 1531, and the canton 10,500 inhabitants, on a territory of 157½ kiliometres, in 30 communes. This town was famous for its ancient abbey, which had once the privilege of coining money, and poſſeſſed a celebrated library, which contained a number of ancient and valuable MSS., among which was the "Chronicum Gemblacenſe," well known among the learned, begun by Sigebert, a monk, who died in the year 1112, and continued by Anſelm, the abbot, to his death in 1137. Gembloux has twice, *viz.* in 1678, and in 1712, ſuffered much by fire.

GEMELLÆ, in *Ancient Geography, Jimmeelah,* an epiſcopal town of Africa, ſituated about four leagues N. E. of Satafi, in the eaſtern part of Mauritania Cæſarienſis. This place is diſtinguiſhed by ſome ancient ruins of the gate of the town, and of an amphitheatre.

GEMELLES, in *Heraldry,* a bearing of bars by pairs, or in couples, in a coat of arms. He beareth gules, on a chevron, argent, three bars gemelles, ſable, by the name of Throgmorton.

GEMELLI, Carreri Francis, in *Biography,* an advocate at Naples, who made the tour of Europe in the year 1683, of which he publiſhed an account in one volume. In 1693, he undertook a voyage round the world, which he completed in 1698, and of this he publiſhed a narrative in the year 1700, which was ſeveral times re-edited, and was tranſlated into French and Engliſh, and admitted into various collections of voyages and travels. This work is frequently referred to and quoted, though the facts contained in it are certainly of queſtionable authority. It is, however, conſidered as valuable for the objects of curioſity it points out, and for the directions it gives for ſafe and uſeful travelling.

GEMELLUS, in *Anatomy,* a name ſometimes given to the *gaſtrocnemius,* which ſee.

GEMERURCH, in *Geography,* a town of Perſia, in the province of Irak; 60 miles S. W. of Kermanſha.

GEMIANA, a town of Egypt, 18 miles S. of Damietta.

GEMIGNANO, St. Vincentio di, in *Biography,* a painter, born at San Gemignano, in Tuſcany, in 1490. who became a diſciple of Raphael, and wrought for him with much ſucceſs in the chambers of the Vatican. He alſo performed many works under the eye of Raphael, in which he imitated the ſtyle and manner of that great man; but when he loſt him, his talents were not found equal to ſupport the reputation he had previouſly acquired. He died in 1530, at the age of 40.

GEMINATED Column. See Column.

GEMINGEN, in *Geography,* a town of Germany, in the palatinate of the Rhine; ſix miles N. W. of Heilbronn.

GEMINI, in *Anatomy,* iſchii-trochanteriens; are two ſmall and ſhort muſcles, ſituated at the poſterior part of the pelvis, the one above, and the other below the tendon of the obturator internus, which they nearly cover. They are diſtinguiſhed from each other by the epithets ſuperior and inferior. The geminus ſuperior extends from the ſpinous proceſs of the iſchium, in a horizontal direction, to the hollow behind the trochanter major of the thigh bone. It lies in front upon the os innominatum, and the capſule of the hip-joint; and is covered behind by the gluteus maximus, and great ſciatic nerve. The upper margin of the muſcle is parallel with, and contiguous to, the under edge of the pyramidalis; while the inferior, by its outer half, is confounded with the tendon of the obturator internus, by its inner half, is connected to the ſame tendon, by means of a thin aponeurotic expanſion. The inner extremity is fixed to the ſpine of the iſchium, from which point the fibres are continued horizontally, to the upper and back part of the trochanter, where the outer extremity is attached. It is compoſed entirely of muſcular fibres, except towards the

outer

outer end, where it has a tendon united to that of the obturator externus.

The geminus inferior refembles the former in figure and direction, covered behind by the gluteus maximus, and great sciatic nerve, it covers in front the os innominatum and capsule of the hip. The lower margin is parallel with, and close to, the upper margin of the quadratus femoris; the upper, like the lower of the preceding muscle, is connected to the tendon of the obturator externus. Indeed the opposed edges of the two gemini are connected together, so as to form a groove, in which the obturator tendon is lodged. The inner extremity is fixed to the upper and back part of the tuberosity of the ischium; the fibres run horizontally outwards, and are attached to the trochanter, close to the preceding muscle. It consists of fleshy fibres, with the exception of the outer extremity.

By drawing the trochanter major backwards, the two gemini will rotate the femur outwards on its axis. When the limb is bent, they will assist in separating it from the opposite, or carrying it into the state of abduction. If the thigh be fixed, they may rotate the pelvis outwards or backwards upon the head of the femur.

Gemini, in *Astronomy*, the *Twins*; a constellation, or sign of the zodiac, the third in order, representing Castor and Pollux; and it is marked thus, II. See Constellation.

This constellation was anciently depicted by a couple of young kids, by the Egyptians and eastern nations, as denoting that part of spring, when these animals appear; but the Greeks altered them to two children, which some of them represented by Castor and Pollux, some by Hercules and Apollo, and others by Triptolemus and Jason; but the Arabians afterwards changed them into two peacocks, their religion not allowing them to paint or draw any human figure. Sir Isaac Newton thinks, that the figures had some reference to the Argonautic expedition. The ancients attributed to every sign of the zodiac one of the principal deities for its tutelary power. Phœbus had the care of Gemini, and hence arose all the jargon of astrologers about the agreement of the sun and this constellation.

Gemini, *St.* in *Geography*, a town of Italy, in the duchy of Spoleto; six miles N. of Narni.

GEMINIANI, Francesco, in *Biography*, a musician of great abilities and renown. He was a native of Lucca, born about the year 1666; and received his first instruction on the violin of Carlo Ambrogio Lonati, of Milan, commonly called Il Gobbo, a celebrated performer on that instrument, who set the opera of "Ariberto & Flavio" for Venice, in 1684. After this, he studied counterpoint under Alef. Scarlatti at Rome, where he became a disciple of Corelli on the violin; and having finished his studies there, he went to Naples, where, from the reputation of his performance at Rome, he was placed at the head of the orchestra; but, according to the elder Barbella, he was soon discovered to be so wild and unsteady a timist, that instead of regulating and conducting the band, he threw it into confusion; as none of the performers were able to follow him in his *tempo rubato*, and other unexpected accelerations and relaxations of measure.

The younger Barbella assured the writer of this article, that his father, who well remembered the arrival of Geminiani at Naples, said he was never trusted with a better part than the tenor during his residence in that city.

He arrived in England in 1714, and in 1716 published in London his first work, consisting of 12 solos for the violin, dedicated to baron Kilmansegge, on the plan of Corelli; six with double stops, and six single, which, though few could execute, yet all the professors allowed them to be masterly; more learned and difficult than those of his model, but not so pleasing. These solos seem to have been previously published at Amsterdam by le Cene; we are in possession of a copy beautifully engraved on copper. In 1726 he formed Corelli's first six solos into concertos, and soon after the last six. He likewise selected six of his sonatas for the same purpose, and imitating his style in composing additional parts to them, manifested how much he respected the originals. It was not till the year 1732 that Geminiani published his first six concertos, which he called his "Opera seconda," and dedicated to the duchess of Marlborough. Soon after this, his "Opera terza," or second set of concertos, appeared, which established his character, and placed him at the head of all the masters then living, in this species of composition.

His second set of solos, commonly called his French solos, either from their style or their having been composed and engraved in France, was published in 1739. These were admired more than played; as about this time it became more than ever the fashion for public solo-players to perform only their own compositions, and others were unable to execute them. His third set of concertos, which appeared about the year 1741, was so laboured, difficult, and fantastical, as never to be performed, to our knowledge, in either public place, or private concert.

His long-promised work, with the title of "Guida Armonica," published in 1742, appeared too late; for though there are many combinations, modulations, and cadences, that would open the mind and enrich the memory of a young student in harmony, he promised too much. The original title runs thus; "Guida Armonica o Dizionario Armonico," being a sure guide to harmony and modulation, in which are exhibited the various combinations of sounds, progressions of harmony, ligatures, and cadences, real and deceptive." It was a kind of mill, in which good music was to be ground with little trouble and no genius; as good sense and science by the Laputan machine, in Gulliver's travels; and his authority in the kingdom was diminished by new music and new performers, as well as by his own frequent change of sentiment: setting up at one time as a model of perfection, what he would despise and condemn at another.

His "Treatise on Good Taste, and Rules for Playing in Good Taste," did not appear till about 1747, but that was too soon for the present times. Indeed a treatise on good taste in dress, during the reign of queen Elizabeth, would now be as useful to a tailor or milliner, as the rules of taste in music, forty years ago, to a modern musician.

In 1748, he published his "Art of Playing the Violin," which was a very useful work in its day; the shifts and examples of different difficulties, and uses of the bow, being infinitely superior to those in any other book of the kind, or indeed oral instruction, which the nation could boast, till the arrival of Giardini.

His composition, called the "Enchanted Forest," in which he endeavoured by mere sound to represent to the imagination of an audience all the events in the episode of the thirteenth book of Tasso's Jerusalem, was published about 1756; but music has never had the power, without vocal articulation, to narrate or instruct; it can excite, paint, and soothe our passions; but is utterly incapable of reasoning, or conversing, to any reasonable purpose.

Besides these practical and theoretical works, he published two books of "harpsichord pieces," that are rendered impracticable by crouded harmony and multiplied notes; and two books upon the "art of accompaniment," which are only intelligible

telligible to thofe who no longer want fuch affiftance; and if practifed, would be intolerable to fingers and folo-players, who wifh to be heard through the tinkling of a harpfichord.

Geminiani was feldom heard in public during his long refidence in England. His compofitions, fcholars, and the prefents he received from the great, whenever he could be prevailed upon to play at their houfes, were his chief fupport. In 1731, he advertifed a "weekly confort" of mufic, to be carried on at Hickford's room, by fubfcription, and at which he played the firft violin himfelf. This concert was advertifed to be carried on the next year by Arrigoni and San Martini, "in the fame manner as by fignor Geminiani, who had declined the undertaking; the firft violin by fignor Carbonelli." In 1741, he had a benefit concert at the little theatre in the Hay-market, by command of their royal highneffes the late prince and princefs of Wales. And in 1749, a "concerto fpirituale," during Lent, at Drury-lane theatre; in which he led the band, and played a concerto, from the fifth folo of his fourth opera, and the tenth folo of the fame fet. The unfteady manner in which he led, feemed to confirm the Neapolitan account of his being a bad mental arithmetician, or calculator of time. After this, he went to Paris, where he continued till 1755, when he returned to England, and publifhed a new edition of his two firft fets of concertos. In 1761, he went to Ireland, to vifit his fcholar Dubourg, mafter of the king's band in that kingdom, who always treated him with great refpect and affection. It is fuppofed that his death was accelerated there the next year, by the lofs of an elaborate treatife on mufic, which he had been many years compiling, and which, by the treachery of a female fervant, was conveyed out of his room, and could never be recovered. Surviving this lofs but a fhort time, he died at Dublin, September 17th, 1762, at the great age of ninety-fix.

Geminiani, with all his harmonical abilities, was fo circumfcribed in his invention, that he was obliged to have recourfe to all the arts of mufical cookery, not to call it quackery, for materials to publifh. In his younger days, when imagination is moft fertile, fixteen years elapfed between the publication of his firft book of folos and his firft fix concertos. Indeed, during that period, he atchieved what a plodding contrapuntift of inferior abilities might have done as well: he transformed Corelli's folos and fix of his fonatas into concertos, by multiplying notes, and loading, and deforming, we think, thofe melodies, that were more graceful and pleafing in their light original drefs. After the publication of his fecond fet of folos, his productions feem to have been the offspring of whim, caprice, expedients, and an unprincipled change of ftyle and tafte, which neither pleafed the public, nor contributed to his own honour or profit. One day he would fet up French mufic againft all other; the next Englifh, Scots, Irifh—any thing but the beft compofitions of Italy or Handel. It is well known how much he preferred the character of a picture-dealer, without the neceffary knowledge or tafte in painting, as very good judges afferted, to that of a compofer of mufic, by which he had fubfifted and acquired all his fame and importance. It is to be feared that a propenfity towards chicane and cunning, which gratifies fome difpofitions more by outwitting mankind, than excelling them in virtue and talents, operated a little upon Geminiani; whofe mufical decifions, ceafing to be irrevocable in England, determined him to try his hand at buying cheap and felling dear; impofing upon groffer ignorance with falfe names, and paffing off copies for originals. As a mufician, he was certainly a great mafter of harmony, and very ufeful to our country in his day; but though he had more variety of modulation, and more fkill in diverfifying his parts than Corelli, his melody was even inferior, and there is frequently an irregularity in his meafures and phrafeology, and a confufion in the effect of the whole, from the too great bufinefs and diffimilitude of the feveral parts, which gives to each of his compofitions the effect of a rhapfody or extemporaneous flight, rather than a polifhed and regular production. His fixth concerto of the fecond fet is always to be excepted, which is the moft pleafing and perfect compofition of the kind, within our knowledge.

GEMINIANO, St., in *Geography*, a town of Etruria, feated on a mountain, with a beautiful palace; near which is a mine of vitriol; 24 miles S. of Florence.

GEMIST, George, in *Biography*, an eminent Greek philofopher, was born at Conftantinople in the year 1390. He refided chiefly in the Peloponnefus, where he acquired a high character for his learning and prudence. He was a zealous advocate for Platonifm, and maintained a violent controverfy with the Ariftotelians. He was a ftrenuous defender of the Greek church againft the Latins, and was confulted as an oracle on the points in debate. When a deputation was fent from Greece to attend the council of Florence, in the year 1438, in order to difcufs the fubject of an union between the Greek and Latin churches, he was appointed a member of it, and fuftained the caufe of the Greeks with an acutenefs of reafoning, and a flow of eloquence which entitled him to the gratitude of his countrymen, and extorted the efteem and admiration of his Latin opponents. But the vifit of Gemift to Italy was more memorable, as it afforded him an opportunity of reviving Platonifm in that country, and he loft no means of expatiating on the fuperior excellence of his favourite fyftem, but defended it in public and private with great fpirit and fuccefs. He made many illuftrious converts among the literary characters then affembled in Florence, and in the number was Cofmo de Medici. By the influence which he had over this patron of fcience and literature, the foundation of a Platonic academy was laid at Florence, and under the inftructions of Gemift, the firft prefident, Marfilius Ficinus, of that inftitution, was formed. After the termination of the council of Florence, Gemift returned to Greece where he died at the advanced age of nearly one hundred years. He left behind him numerous works, which afford ample evidence of his profound erudition, and of his intimate acquaintance with the Alexandrian Philofophy. The principal are "De Geftis Græcorum poft pugnam ad Mantineam, duobus Libris digefta." "De virtutibus Libellus," which has been reprinted in many forms, and illuftrated by various commentators: "De rebus Peloponnefiafis conftituendis Orationes duæ," with an appendix containing a defcription of all the places in the Peloponnefus, their longitudes and latitudes taken from Ptolemy, and corrected by the author: "De Platonicæ et Ariftotelicæ Philofophiæ Differentia." Gemift was author likewife of a number of theological, hiftorical, rhetorical, and philofophical pieces: alfo of a work entitled "In Oracula magica Zoroaftris Commentarii," in which he gives an elegant compendium of the Platonic philofophy. Moreri. Enfield's Hift. Phil

GEMMA, Cornelius, the fon of Reinier Gemma, (who was a phyfician, but diftinguifhed chiefly by his mathematical and aftronomical knowledge,) was born at Louvain in February, 1535. He became royal profeffor of medicine in his native place in 1569, through the appointment of the duke of Alba, at which time he took the degree of doctor. But he did not enjoy his honours many years; for he was cut off by the plague, which raged at Louvain, on the

the 12th of October 1577. His writings are not numerous, and relate to mathematical and philosophical subjects as well as to medicine.

Gemma, John Baptist, a native of Venice, and a physician of considerable repute about the end of the fifteenth century. He was physician to Sigismund III. king of Poland. He wrote a treatise, containing a history of pestilential epidemics, with a detail of the effects of contagion, &c., and entitled, "De vera ratione curandi bubonis atque carbunculi pestilentis deque eorundem, Commentarius." 1584. Eloy.

Gemma, in *Botany* and *Vegetable Physiology*, a bud, most probably from γεμω, *to be full*. See Bud.

In addition to what is said in that place, it is necessary to caution the student against an error of some philosophers, especially Dr. Darwin in the ninth section of his *Phytologia*, who draws a too close, and indeed erroneous, analogy, between buds and the embryo of a seed, or the chick in the egg. By buds, it is true, plants are propagated and increased, and in that sense each bud becomes a separate being, or new plant; but such propagation is only the extension of an individual, and not a reproduction of the species, in consequence of sexual impregnation, as by seed. This was long ago observed, in opposition to the opinions and experiments of Spallanzani, by the author of the present article. See Dissertation on the Sexes of Plants, translated from the Latin of Linnæus, p. 45, note. Accordingly, all plants increased by buds, cuttings, layers or roots, retain precisely the peculiar qualities of the individual from which they are taken. Thus varietiesare propagated, which commonly vanish in the legitimate seminal progeny, and thus, as Mr. Knight has observed of the different kinds, or varieties, of apples and pears, each individual so propagated has only a determinate period of existence. The date of such varieties in Cape Geraniums is usually very short; in apples and pears it is generally, not always, very much longer; in willows, so readily increased by cuttings, apparently without end, it seems to be almost unlimited, for no cultivator has yet remarked any advantage in renewing osiers of any kind from seed; but we apprehend the subject has not been properly attended to. As such willows do, to our knowledge, sow themselves frequently, their seedlings mayunconsciously be preferred, for some characters of vigour in their appearance, by those who are about to choose cuttings. Gardeners well know that many of the most hardy perennial herbs require frequent renewal from seed, in order to exist with vigour. Propagation by seed is therefore the only true reproduction of plants. How that is accomplished we have already explained. See Fecundation *of Plants*.

Some very eminent Cryptogamic botanists, as Gærtner and even Acharius, contend for esexual propagation in the lower tribes of vegetables. This is particularly insisted upon by the former with respect to *Fuci*, in the introduction to his great work on seeds, p. 32; and yet what he details in the following page, of the impregnation of the seeds of those plants by a mucus formed in their germen or ovarium, is really equivalent to sexual impregnation. Acharius extends the esexual theory, not indeed without some doubts, to *Byssi*, *Lichenes*, and *Fungi*. If however the propagation of these or any other plants be truly esexual, what these writers term *sporæ*, and seem to think equivalent to seeds, are essentially nothing but *gemmæ*, and the analogy of all other vegetables is against any continued propagation or reproduction by such means. It was a most extraordinary and unaccountable oversight in the great Hedwig, to adopt this term of *spora* for the seed of mosses, though his own brilliant theory of their sexual impregnation, which has brought him so much deserved reputation, proves that part to be a real seed; whereas the term *spora*, indicating the contrary, serves only to invalidate his own hypothesis! S.

Gemma *Veneris*, in *Natural History*, a name given by some of the Latin poets, and other authors in that language, to a gem, which was much esteemed by the Romans, and set in rings. It was called by the Greeks *aphrodites*. Many have supposed this to be the opal; but it is certain, from the oldest accounts, that the most beautiful kind of the amethyst was the gem they called by this name. They distinguished the amethyst as all the other gems, into several kinds, according to the degrees of the colour; and to the most eminent of these they gave peculiar names, as is evident in the several kinds of the emerald and beryl. The worst amethysts were those which had very little colour beyond that of crystal, and the very best were those which had the fine red of the carbuncle, mixed with the purple of the violet, and the whole so pale, that a rose-colour seemed blended with them, and predominated over the rest. These, Pliny tells us, were called *pæderotes* and *anterotes*, and were the gems called, from their beauty, *aphrodites lapis*, and *gemma Veneris*; but all these names have been since given by others to the opal.

Gemmæ, *Sal*, is peculiarly used for rock salt, or salt dug out of mines. See Salt.

The name gemma is applied to this on occasion of its lustre and brilliancy, which is not unlike that of crystal.

The principal mines of this salt are those of Wilisca, in Poland; those of Eperia, in Upper Hungary; and those of Cardonna, in Catalonia.

The chief use of this salt is for the powdering or pickling of meats, in places destitute of salt springs, &c.

GEMMEUM, an epithet used by the Latins to express such vessels as were called *dialitha* and *lithocolla* by the Greeks. The more correct Roman authors, however, call this *gemmatum poculum*, and not *gemmeum*; the word gemmeum signifying properly a vase or cup, cut out of a single stone, as an agate, or the like; but gemmatum expressing those fine vases of gold, which were ornamented with emeralds and other precious stones.

GEMMI, in *Geography*, part of a chain of mountains of Switzerland, which separates the canton of Bern from the Vallais; the point of which, that overlooks and almost overhangs the Vallais, affording a most extensive prospect over that fertile country and the rugged alps of Savoy. Although this mountain is, in many places, almost perpendicular, a horse-road has been hewn in the hard rock down this formidable descent. This astonishing work was begun in 1736, and finished in 1741, at the joint expence of the Vallais and the canton of Bern. More than a league of it has been blown up with gunpowder. This road is about nine feet broad, and quite hangs over the precipice; in some parts it is hollow, open only at one side, the rock above projecting over it, of the same breadth. The effect is very striking; for, as the road winds continually, the scene also changes; so that at one moment the passage commands an extensive view, and in the next is inclosed with barren rock. The descent from the top to the plain is about two leagues.

GEMONA, a town of Italy, in Friuli, old but opulent. In this place the merchandise brought from Germany is detained and searched by officers of the customs. The district contains 32 villages. In 1797, it was taken by the French; 21 miles N.W. of Friuli. N. lat. 46° 20'. E. long. 12° 59'.

GEMONIÆ Scalæ, or *Gradus Gemonii*, among the

Romans, was much the fame as a gallows, or gibbet, in England.

Some fay, they were thus denominated from the perfon who raifed them; others, from the firft criminals that fuffered on them; and others, from the verb *gemo*, *I figh* or *groan*.

The *gradus gemonii*, according to Publius Victor, or Sextus Rufus, was a place raifed on feveral fteps, from whence they precipitated their criminals; others reprefent it as a place whereon offenders were executed, and afterwards expofed to public view. The gemoniæ fcalæ were in the tenth region of the city, near the temple of Juno. Camillus firft appropriated the place to this ufe, in the year of Rome 358.

GEMONIDES, a name by which fome of the ancients have called the peantides; probably the fame with our ftalactites, a ftone famous with them for its fuppofed virtue in promoting delivery.

GEMOTE, or GEMOT, *Conventus*, a Saxon word, denoting a meeting or affembly.

"Omnis homo pacem habeat eundo ad gemotum & rediens de gemoto, nifi probatus fur fuerit." Ll. Ed. Conf. See WITTENA.

GEMOZAC, in *Geography*, a town of France, in the department of the Lower Charente, and chief place of a canton, in the diftrict of Saintes; 10 miles S. of Saintes. The place contains 2396, and the canton 15,759 inhabitants, on a territory of 247½ kiliometres, in 17 communes.

GEMSHORN, a ftop in German organs, which anfwers to our principal and flute. It is 16, 8, 4, or 2 feet, in proportion to the fize of the inftrument. Walther.

GEMUND, in *Geography*, a town of France, in the department of the Roer, and chief place of a canton, in the diftrict of Aix-la-Chapelle, feated on the Ruhr; 41 miles W.N.W. of Coblentz. N. lat. 50° 37'. E. long. 6° 28'.

GEMUND, or *Gmund*, a town of Wurtemberg, on the Rembs. In 1802, this town, which was imperial, was granted among the indemnities to the duke (now king) of Wurtemberg; 24 miles E. of Stuttgart. N. lat. 48° 44'. E. long. 9° 50'.

GEMUND, or *Gemunden*, a town of Germany, in the bifhopric of Wurtzburg, on the right bank of the Maine, where it is joined by the united ftreams of the Saal and the Sinn; 37 miles E. of Frankfort. N. lat. 50° 9'. E. long. 9° 52'.—Alfo, a town of Auftria, fituated on the Traunfee, celebrated for its falt-works; 24 miles S.S.W. of Lintz. N. lat 47 65'. E. long. 13° 42'.

GEMUND, a town of the duchy of Carinthia; 32 miles N.W. of Clagenfurt. N. lat. 46° 50'. E. long. 13 21'.—Alfo, a town of Auftria; 60 miles N.W. of Vienna. N. lat. 48° 44'. E. long. 15° 3'.

GEMUNDEN, a town of France, in the department of Mont Tonnerre, famous for its fairs; 3 miles E. of Wefterburg.—Alfo, a town of Germany, in the principality of Heffe-Caffel; 28 miles S.W. of Caffel. N. lat. 50° 59'. E. long. 9.—Alfo, a town of Germany, in the principality of Calenberg; 13 miles S.W. of Gottengin.

GEMURSA, in *Surgery*, an excrefcence between the toes.

GENA. See CHEEK.

GENABUM, in *Ancient Geography*, called alfo "Civitas Aurelianorum," a town of Gaul, in the country of the Carnuti, fuppofed by fome to be *Gien*, but by others, with greater probability, *Orleans*. Cæfar mentions it; and Strabo calls it the "emporium of the Carnuti," and fays that it was fituated upon the Loire, towards the middle of its courfe. The communication was fo eftablifhed, and fo neceffary between this town and Chartres, that they had a public way, ftill in fome degree of prefervation, which was called the "way or road of Cæfar."

GENABUS, an epifcopal town of Afia, in Phrygia.

GENADEL, in *Geography*, a mountain of Nubia, over which the Nile paffes, and forms a cataract; 120 miles S.S.W. of Syene.

GENADGE, a town of Egypt; 12 miles S. of Faoué.

GENÆ QUADRATUS. See QUADRATUS.

GENAPILLA, in *Geography*, a town of Hindooftan, in the Carnatic; 36 miles W. of Nellore.

GENAPPE, a town of France, in the department of the Dyle, and chief place of a canton, in the diftrict of Nivelles, fituated on the Dyle; 5 miles E. of Nivelles. The place contains 1186, and the canton 8842 inhabitants, on a territory of 132½ kiliometres, in 71 communes.

GENARO MANNI, in *Biography*, a celebrated Neapolitan compofer, in a folid yet ingenious ftyle, between that of the church and the theatre. He was compofer of the archiepifcopal church at Naples in 1770, and much refpected by profeffors and real judges of mufic in that capital. His name will be embalmed with that of Jomelli, for his pious and active zeal at the public funeral of that admirable mafter in 1774, which he projected and conducted in a manner equally honourable to himfelf and his deceafed friend. Sig. Saverio Mattie, the learned commentator and tranflator of the Pfalms into Italian verfe, arranged in ftanzas, and fitted for mufic of every fpecies in the ecclefiaftical ftyle, has recorded this event in an interefting pamphlet, which will live, and add longevity to the fame of thefe eminent profeffors.

GENBARABA, in *Geography*, a town of Perfia, in the province of Irak; 100 miles E. of Hamadan.

GENBITA, a town of Africa, in Nubia; 65 miles N.E. of Dekin.

GENÇAY, a town of France, in the department of the Vienne, and chief place of a canton, in the diftrict of Civray; 12 miles N.N.E. of Civray. The place contains 628, and the canton 8169 inhabitants, on a territory of 270 kiliometres, in 11 communes.

GENDARMES, or GENS D'ARMES, *q. d.* men of arms, a term ufed among the French for a felect body of horfe-guards; becaufe they fucceeded the ancient men of arms, who were armed at all points, and thence were called gendarmes. Under the old government of France, the troops of the king's guard de corps, the mufqueteers, and light-horfe, were reputed to belong to the gendarmerie.

The grand-gendarmes, fometimes called fimply the gendarmes, were a troop of gentlemen, to the number of about 200, and in time of war 240, who guarded the king's perfon. The king himfelf was their captain, and one of the prime peers the captain-lieutenant, under whom were two fub-lieutenants, three enfigns, and three guidons. When the king marched with all his houfhold troops, the gens d'armes clofed the march. They were eftablifhed about the year 1665.

Their device was a thunder-bolt falling from heaven, with the motto, "Quo jubet iratus Jupiter." There were alfo, befides thefe, gens d'armes of the queen, the dauphin, &c.

The gendarmery was a body of horfe, confifting of fixteen companies, forming eight fquadron, *viz.* the Scotch gendarmes, the Englifh gendarmes, the Burgundy gendarmes, and the Flemifh gendarmes, which four companies compofed the king's gendarmes, or life-guard. The other companies took their names from the princes who commanded them, as captains, *viz.* the queen's gendarmes, the queen's light-

light-horfe; the dauphin's gendarmes, the dauphin's light-horfe; the duke of Burgundy's gendarmes, the duke of Burgundy's light-horfe; the duke of Orlean's gendarmes, &c. each troop, at a medium, confifted of feventy-fix gendarmes, or light-horfe. Each company was divided into two brigades, one commanded by the captain-lieutenant, and the other by the fub-lieutenant; and the fubordinate officers were an enfign and guidon.

The gendarmerie took precedence of every regiment of horfe in the French fervice, and ranked immediately after the king's houfhold. The uniform of this felect body of cavalry, under the old government, was fcarlet, with facings of the fame colour. The coat was formerly more or lefs laced with filver, according to the king's pleafure. A little while before the revolution, it was only laced on the cuff. The waiftcoat was of buff-leather, and the bandouleer of the fame, filver-laced; the hat was edged with broad filver lace. The horfe-cloths and holfter-caps were red, and the arms of the captain were embroidered on the corners of the faddle-cloths, and on the front of the holfters. In 1762, a confiderable body of men was raifed by order of Louis XIV., and the foldiers that compofed it were called gens d'armes; and in 1792, their number, confifting of horfe and foot, was augmented, and both were denominated indifcriminately gens d'armes; but their cloathing was altered to deep blue. Their pay was greater than that of the reft of the army; and their privileges were founded on the claims to military honour, which they were obliged to produce, before they were enlifted. Every individual was to exhibit a certificate of fix or eight years' fervice.

GENDER, Genus, in *Metaphyfics*. See Genus.

Gender, in *Grammar*, denotes a divifion or diftinction of nouns or names, according to the different fexes of the things they denote.

It has been thought proper, in order to render difcourfe more exprefs and diftinct, as alfo to embellifh it by a variety of terminations, to contrive certain diverfities in adjectives, accommodated to the fubftantives they are applied to; whence, from a regard to that notable difference there is between the two fexes, all nouns fubftantive have been diftinguifhed into mafculine and feminine; and the nouns adjectives alfo varied to correfpond therewith.

Mr. Harris, obferves, that in the diftribution of genders, fuch fubftantives might have been confidered as mafculine, which were confpicuous for the attributes of imparting or communicating; or which were, by nature, active, ftrong, and efficacious, and that indifcriminately whether to good or ill; or which had claim to eminence, either laudable or otherwife; the feminine, on the contrary, were fuch as were confpicuous for the attributes either of receiving, of containing, or of producing and bringing forth; or which had more of the paffive in their nature than of the active; or, which were peculiarly beautiful and amiable; or which had refpect to fuch exceffes as were rather feminine than mafculine. Thus the fun, the fky, time, death, God, &c. are mafculine; but the moon, the earth, a fhip, a city, country, virtue, fortune, &c. are feminine. Hermes, p. 44, &c.

But as there was an infinity of words, which had no proper relation, either to the one fex or the other, they had genders affigned them, rather out of caprice than reafon; and hence it is, that the gender of a noun is frequently dubious and fluctuating. Though, as there are fubftantives that have evidently no fex, the neuter gender expreffing fuch fubftances is as natural and rational a diftinction as either of the others.

It fhould here, however, be obferved, that this inftitution of genders was not made with defign and deliberation by the mafters of language, but was introduced by cuftom and ufage. At firft, there was only a difference between the names of animals, when fpoken of males and females; and, by degrees, the fame regulation was extended to other things: the grammarians have only noted and allowed what ufage had eftablifhed. The oriental languages frequently neglect the ufe of genders; and the Perfian language has abfolutely none at all, which is no difadvantage; the diftinction of genders being in great meafure ufelefs.

The Latins, Greeks, &c. generally content themfelves to exprefs the different genders by different terminations, as *bonus equus*, a *good horfe*; *bona equa*, a *good mare*, &c. But in Englifh we frequently go farther, and exprefs the difference of fex by different words; as *boar*, *fow*; *boy*, *girl*; *buck*, *doe*; *bull*, *cow*; *cock*, *hen*; *dog*, *bitch*, &c.

We have only about twenty-four feminines, diftinguifhed from the males, by the variation of the termination of the male into *efs*; of which number are *abbot*, *abbefs*; *count*, *countefs*; *actor*, *actrefs*; *heir*, *heirefs*; *prince*, *princefs*, &c. which is all that our language knows of any thing like genders.

The eaftern languages, as well as the vulgar languages of the weft, have three genders; the mafculine, feminine, and neuter. The Greek and Latin have likewife the neuter, common, and the doubtful gender; and befides thefe, they have the epicene, or promifcuous, which, under one fingle gender, and termination, includes both the kinds.

The Englifh language, with fingular propriety, following nature alone, applies the diftinction of mafculine and feminine only to the names of animals; all the reft are neuter; except when by a poetical or rhetorical fiction things inanimate and qualities are exhibited as perfons, and confequently become either male or female. And this gives the Englifh an advantage above moft other languages in the poetical and rhetorical ftyle; for when nouns naturally neuter are converted into mafculine or feminine, the perfonification is more diftinctly and forcibly marked. Lowth's Grammar, p. 44. ed. 1772.

Gender, in *Geometry*. Geometrical lines are diftinguifhed into genders, or genera, claffes, or orders, according to the number of the dimenfions of the equation that expreffes the relation between their ordinates, and the abfciffas.

Gender, in *Botany*. See Genus.

Gender, in *Mufic*, &c. See Genera.

GENDIE, in *Geography*, a town of Egypt, on the left bank of the Nile; 4 miles N. of Abu-Girgé.

GENDRE, Gilbert-Charles le, in *Biography*, marquis de St. Aubin, was a counfellor in the parliament of Paris, and afterwards mafter of requefts. He is known by two works of confiderable reputation, thefe are; "Traité de l'Opinion, ou Mèmoires pour fervir á l'Hiftoire de l'Efprit Humain," fix vols, 12mo., and "Antiquitès de la Maifon de France," 4to. The former confifts of a great variety of hiftorical examples to elucidate the power of opinion in the fciences, accompanied with reflections; the latter is a work of deep and curious refearch concerning the origin of the regal dynafties of France. Moreri.

Gendre, Louis le, was born of an obfcure family at Rouen in 1659. Through the favour and great kindnefs of M. de Harlai, then archbifhop of Rouen, afterwards of Paris, he received an excellent education, and was in 1690 prefented with a canonry in the cathedral of Paris. His firft effays as an author were two eulogies and a life of his patron, the ftyle of which has been much approved by able critics.

In

In 1697 he publifhed " Effays on the Reign of Louis le Grand," which he prefented, in perfon, to the monarch, and which were fo well received by the public as to pafs through four editions in eighteen months. After this, he gave the world his " Hiftory of France to the Death of Lous XIII.," in three vols. folio. This is efteemed one of the moft exact abridgments of French hiftory, and is written with great fimplicity. He died at Paris in 1733, at the age of 74. Befides the works already mentioned, he publifhed " A Treatife upon the Manners and Cuftoms of the French at different Periods of their Monarchy :" and " A Life of the Cardinal Amboife, with a Parallel of the celebrated Cardinals who have governed States." At his death he left five hiftories of his own life, each compofed in a different ftyle and manner, which he directed to be made public. He left alfo bequefts for various fingular foundations, fome of which, after exciting difputes relative to their fulfilment, were applied by authority to the inftitution of prizes in the univerfity of Paris. Moreri.

GENDREY, in *Geography*, a town of France, in the department of the Jura, and chief place of a canton in the diftrict of Dôle; 10 miles E. of Auxonne. The place contains 652, and the canton 4399 inhabitants, on a territory of 94 kiliometres, in 95 communes.

GENDRON, Claude-Deshais, in *Biography*, doctor of the faculty of Montpellier, phyfician in ordinary to Monfieur, the brother of Louis XIV., and afterwards to the duke of Orleans, when regent, was a native of Beauce. He exhibited in his early youth a confiderable zeal and talent for natural hiftory and medicine, and anxioufly fought the fociety of men of fcience and literature, with a view to profit by their inftructions, and to learn the beft mode of profecuting his ftudies. He foon became diftinguifhed by the fuccefs of his practice in many cafes of chronic maladies of difficult cure. To the reputation, thus acquired, he added thofe qualities of the mind and heart which endear a man to fociety, at the fame time that he detefted all flattery and difguife. At an advanced age he quitted his profeffion, and retired with an ample income to Auteuil, near Paris, where he was vifited by all defcriptions of the great, by minifters, ambaffadors, and men of fcience, and various other perfons of both fexes. He lived in this retirement with true Chriftian philofophy, and died on the 3d of September, 1750, at the age of 87, univerfally lamented. He wrote two treatifes, the one entitled, " Recherches fur la Nature et la Guérifon du Cancer," Paris 1601 :—the other " Recherches fur l'Origine le Développement, et la Reproduction des êtres Vivans."

A nephew of the preceding, Louis Florent Defhais-Gendron, alfo a phyfician, was the author of two treatifes on the difeafes of the eyes. Eloy. Dict. Hift.

GENDUR, in *Geography*, a town of Hindooftan, in Dowlatabad; 24 miles N. of Naldowrouk.

GENEALOGICA Arbor. See Arbor.

GENEALOGY, a feries or fucceffion of anceftors, or progenitors; or, a fummary account of the relations and kindred of a perfon, or family, both in the direct and collateral lines.

The word is Greek, γενεαλογία, which is formed of γενος, *genus, profapia, race*, and *linage;* and λογος, *fermo, difcourfe.*

In divers chapters, and military orders, it is required, that the candidates produce their genealogy, to fhew that they are noble by fo many defcents.

The genealogical degrees are ufually reprefented in circles, ranged over, under, and afide of each other. The ancients had the like, which they called *ftemmata*, from a Greek word, fignifying *crown, garland*, or the like. See Consanguinity and Descent.

The Jews were very anxious for preferving their genealogies entire and uninterrupted; and this care on their part affords an argument of confiderable importance with refpect to the accomplifhment of thofe ancient prophecies that pertain to the Meffiah. Accordingly, in their facred writings we find genealogies carried on for above 3500 years. It is obferved (Ezra, ii. 62.) that fuch priefts as could not produce an exact genealogy of their families were not permitted to exercife their functions. Jofephus fays that they had, in his nation, an uninterrupted fucceffion of priefts for 2000 years; that the priefts were particularly careful to preferve their genealogies, not only in Judæa, but alfo in Babylonia and Egypt; and that, wherever they were, they never married below themfelves, and had exact genealogical tables prepared from thofe authentic documents which were kept at Jerufalem, and to which they had recourfe; and that, in all their wars, perfecutions, and calamities, they always were diligent in fecuring thofe documents, and in renewing them from time to time. Jerome fays (ad Tit. iii.) that the Jews know fo perfectly the genealogies, that they can repeat all the names from Abraham to Zerubbabel, as eafily as their own. Neverthelefs, fince the war of the Romans againft the Jews, about 30 years after the death of our Saviour, and fince their entire difperfion in the reign of Adrian, the Jews have loft their ancient genealogies; and perhaps there is not even one of the facerdotal race who can produce authentic proofs of his genealogy. This circumftance has been alleged by Chriftian writers as a prefumptive proof of the actual advent of the Meffiah, whofe genealogy, correfponding to ancient predictions, the Jews are no longer able to trace, and confequently of the truth of Chriftianity. It is obfervable, that the genealogies fet down by Ezra and Nehemiah vary in fome particulars. Of this difference Dr. Prideaux (Conn. Pt. i. b. 4.) gives the following account: " For the true fettling of thefe genealogies fearch was made by Nehemiah for the old regifters, and having found among them a regifter of the genealogies of thofe who came up at firft from Babylon, with Zerubbabel and Jofhua, he fettled this matter according to it, adding fuch as afterwards came up, and expunging others whofe families were extinguifhed; and this has caufed the difference between the accounts which we have of thefe genealogies in Ezra and Nehemiah. For in the fecond chapter of Ezra we have the old regifter, made by Zerubbabel; and in the feventh of Nehemiah, from the fixth verfe to the end of the chapter, a copy of it, as fettled by Nehemiah, with the alterations I have mentioned."

The genealogies of Chrift, recorded by St. Matthew (ch. i.) and St. Luke (ch. iii.) in their refpective gofpels, have occafioned no little perplexity to biblical commentators and critics. The genealogy of Chrift by Matthew is generally fuppofed to be that of Jofeph his reputed father; and that given by Luke to be that of his mother Mary, whom one of the Jewifh rabbis calls the daughter of Heli. But according to Eufebius, who admits both the genealogies, as indeed they were generally received by the ancient fathers, and who cites a long paffage from a letter of Julius Africanus, in which he endeavours to obviate the difagreement between them, it was a tradition in the family of Jofeph, that he was properly the *legal fon* of Heli, and that, as he died without children, his brother Jacob married his wife, and having a child by her, it was transferred to Heli. If the genealogy of Matthew be compared with the correfponding genealogies in the Old Teftament, it will be found to differ from them in feveral refpects; but it was probably fuch a

genealogy as was generally allowed to be of authority; and it sufficiently proved the descent of Jesus from David. The difference between the two genealogies, and the omission of three persons by Matthew (v. 8.), who were all descendants of David, do not, of themselves, warrant our disputing the authenticity of the two first chapters of Matthew's gospel, as some have done. The omission of Matthew might either be in the record copied by him, or it might have been occasioned by some early transcriber. Allowing the former to be the case, the 17th verse, which makes the generations between David and the Babylonish captivity to be no more than fourteen generations, must, as bishop Pearce observes, be an interpolation. We refer, without farther enlarging, to the numerous commentators and critics, who, in their harmonies and comments, have written on the subject.

Genealogical tables are of great use for exhibiting at one view, and in a compendious manner, the descent of families.

The most natural order of these tables seems to be to place the common stock at the head of the table, and the several descents, or succeeding generations, each in a lower line appropriated to it; and not to make the order of generations to proceed from the left hand to the right, as is done by some. But every distinct generation should by all means be placed in a line or space appropriated to itself; otherwise our ideas will be greatly confused. The order of birth in the same generation may easily be observed (as is done in some of our best tables) by placing the first-born to the left hand in the table, and the rest, according to the order of birth, to the right.

There is a variety of other relations, besides mere natural descent, of which it is very useful to have a clear idea, as the connection by marriage, by adoption among the Romans, &c. by which different families are intermixed. And it is possible, by different kinds of lines, joining the names so connected, how remote soever, in the table of generation, to express all those relations without the use of words. But as the attempt to express them all by characters disfigures the table with a great variety of lines, many of them of considerable length, and extending themselves in every direction, it seems most convenient to express *natural descent* only by characters, and to subjoin to each name an account, in words, of all its other connections, referring at most from one to another, by *marks* contrived for that purpose. This method Rapin has taken in the excellent genealogical tables in his "History of England."

Some valuable tables of genealogy may be seen at the end of "Petavius's Chronology;" but the largest and most complete body of genealogies is that published by Anderson; which, in one large volume folio, contains all the genealogies he could collect from the whole body of history, ancient and modern. Priestley's Lectures on History, sect. xvii.

GENEBRARD, Gilbert, in *Biography*, was born at Riom, in Auvergne, about the year 1537. At a very early age he entered into the Benedictine order in the diocese of Clermont, and went to pursue his studies at Paris, where he learned Greek under Turnebius, philosophy under Carpentier, and theology under Claude de Saintes. He soon became distinguished for his great learning, and in 1563 was admitted to the degree of doctor of divinity by the college of Navarre, and was afterwards appointed regius-professor of the Hebrew language. He was nominated to several important offices in the church, but being disappointed in his expectations of a bishopric through the intrigues at court, he joined the party of the League, of which he became a zealous advocate. The numerous writings which he published against those who supported the measures of the court and the reformed religion were uncommonly bitter and furious. They had however sufficient influence to obtain for him the archbishopric of Aix, to which see he was consecrated in the year 1593. Here he continued to shew his hostility to the court, and went so far as to declaim against the king, in his sermons, even when his own cause was hopeless. The League being broken up, and Henry IV. generally acknowleged throughout the kingdom, Genebrard thought it advisable to retire to Avignon, where he published a treatise "De Sacrarum Electionum Jure, ad Ecclesiæ Romanæ Reintegrationem," in which he displayed so much violence against kings and princes, that he was prosecuted and sentenced to perpetual banishment. He was, however, permitted to retire to his priory at Semur, but his book was ordered to be burnt by the hands of the common executioner. He died in 1597, when little more than sixty years of age. His works are very numerous, and many shew that he possessed very considerable erudition, and that he was as industrious in the investigation of the subjects on which he wrote as he was learned. His principal pieces were "A sacred Chronology," more exact than any that had before appeared. Notes and Commentaries on various books of the Old Testament. "An Introduction to the reading of Hebrew and other Eastern Languages without Points." "A Treatise against the Eternity of the World." "An Edition of Origen's Works," and a translation of the works of Josephus into the French language. Moreri.

GENENNE, El, in *Geography*, a town of Egypt; 60 miles S. of Girgé.

GENERA, in *Ancient Greek Music*, implied, according to Euclid, the different divisions and dispositions of the tetrachord or fourth, as to the intervals of the four sounds of which it is composed.

Plutarch (de Musica) says, that it is not sufficient for a musician to know what kind of music should be set to any particular poem; he should likewise know how to write it down in all the genera, that is to say, in the diatonic or natural scale, consisting of tones and semitones, as at present; in the chromatic, in which the scale was divided into semitones and minor thirds; and in the enharmonic genus, moving by quarter tones, and major thirds.

In modern music the genera are but two; diatonic and chromatic. These consist in the manner of arranging the tones and semitones of which melody is composed.

When no more than two semitones occur in the course of an octave, the melody may properly be styled genuine diatonic.

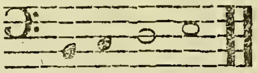
Indeed the chromatic in use at present can hardly be compared with that of the ancients; for with them every accidental flat or sharp which led to a new mode or key, would have been called a change of genus. With us, however, a mere change of modulation, though it occasions a change of key, is not a change of genus; for while the sounds made use of in harmony and melody can be referred to any one key, the diatonic genus is supposed to be preserved: it is only a regular succession of two or more semitones, ascending or descending, that constitutes modern chromatic.

In ancient music, not only the tone was divided into two, as with us, but the semitone by a diesis or quarter-tone. These three kinds of interval, the tone, semitone, and diesis, constituted the difference of the three genera.

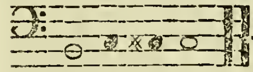
The fourth being the constant boundary of sounds in the music of the ancients, as the octave is in that of the moderns, its extremes, or lowest and highest sounds, were *stantes*, *immobiles*, or fixed. As the octave in modern music admits of no change, but is tuned as perfect as possible, so the

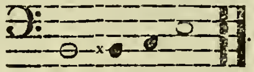
the fourths in ancient muſic were never allowed to deviate from perfection.

The different genera were therefore characterized by the changes made in the two middle ſounds of the tetrachords, that were ſtiled *mobiles*, mutable.

In the diatonic genus, the melody proceeded by a ſemitone, and two tones, as B C D E ;

and it was from the ſucceſſion of two tones, that this genus acquired the name of *Diatonic*. As the term is derived from διὰ, *by*, and τόνος, *tone*; that is, paſſing from one tone to another; which, in the Greek muſic, was never done but in the diatonic genus.

The *Chromatic* proceeded by two ſucceſſive ſemitones, and a hemiditone, or minor third, as B C C ※ E . This modulation holding the middle place between the diatonic and enharmonic, has been ſuppoſed by Martianus Capella and Bryennius, to derive its name from χρῶμα, *colour;* for as the gradations between black and white are called colours; ſo this genus, being placed between the diatonic and enharmonic, is called *chromatic*. M. Rouſſeau tells us, in his Dictionary, that this genus uſed to be written in coloured notes, but without giving any authority in ſupport of this opinion.

The *Enharmonic* tetrachord proceeded by two quarter tones, and a major third, B B × C E .

This genus is often called by Ariſtoxenus, and others, ſimply ἁρμονια, *harmonia*, that is, well arranged and ordered.

Ariſtoxenus tells us, that the diviſions and bounds of the genera were not accurately fixed till his time; and Ariſtides Quintilianus ſpeaks of ſeveral genera, or ſpecies of intervals, which were of the higheſt antiquity; yet ſo wild and irregular, that after the art of muſic was brought to a greater degree of perfection, and the laws of the three principal genera were ſettled, they had been totally diſuſed by the beſt muſicians. The ſame author aſſerts, that it is of theſe barbarous diviſions of the ſcale, or old harmonies, as they were called, and not the common modes of the ſame names, that Plato ſpeaks in his Republic, where he admits ſome of them, and rejects others.

The ancients attributed peculiar effects to each genus, and ſpeak of many characteriſtic diſtinctions of genera, which now appear to be wholly fanciful and imaginary. Theſe, if they ever had exiſtence, were, perhaps, deſtroyed by modern harmony. Ariſtides Quintilianus, p. 111, tells us, that

The diatonic is manly and auſtere;
The chromatic ſweet and pathetic; and
The enharmonic animating and mild.

Vitruvius, ſpeaking of the enharmonic, ſays, that it is in a particular manner grave and majeſtic. "Cantus ejus maximè gravem, et egregiam habet auctoritatem."

Perhaps the idea of a major-key, which the enharmonic ditone muſt impreſs upon the ear, may have contributed to the notion of muſic in that genus being animating; but how it could be at the ſame time grave and ſoothing, animating and mild, is not eaſy to conceive. This genus was never known to the Romans, having been loſt before they attempted the polite arts.

And Plutarch, in his firſt Eſſay againſt Colotes, the Epicurean, aſks, "Why does the chromatic genus melt and diſſolve, and the enharmonic brace the nerves, and compoſe the mind, after being diſturbed?"

Ariſtides Quintilianus, in another place, (p. 19. Edit. Meibom.) ſays of the genera, that the diatonic is the moſt natural, becauſe all who have ears, though uninſtructed in muſic, are capable of ſinging it.

The chromatic is more artificial, for it can be ſung only by ſuch as are adepts in muſic.

The enharmonic is the moſt refined and difficult of all, and has been received and practiſed only by the greateſt artiſts. See Enharmonic and Music *of the Ancients*.

GENERAL, ſomething that comprehends all, or extends to a whole genus, or kind.

All the ſciences have ſome general principles, or axioms. General councils are particularly called œcumenical.

General *Aſſembly*, *aſſizes*, *averment*, *council*, *demurrer*, *diet*, *fee-tail*, *fund*, *geography*, *gravity*, *imparlance*, *iſſue*, *legacy*, *nature*, *occupancy*. See the ſeveral ſubſtantives.

General *Officers*, in an *Army*, are thoſe who do not only command over a ſingle company, or regiment, but whoſe office and authority extend over a body of ſeveral regiments of horſe and foot.

Such are brigadier-generals, lieutenant-generals, major-generals, generals of the horſe, and of the foot. All officers above the rank of lieutenant-colonel are called general officers. See General, below. See alſo Paymaster-*general*, Commissary-*general*, Mustermaster-*general*, &c. and Pay.

We have alſo officers in law, in the revenues, &c. diſtinguiſhed by the appellation of general: as attorney-general, ſolicitor-general, &c. receiver-general, comptroller-general, &c.

General *pauſe*, *qualities*, *ſeſſions*, *ſtatutes*, *tail*. See the ſubſtantives.

General *terms* or *words*, are ſuch as expreſs or denote general ideas.

Ideas become general, by ſeparating from them the circumſtances of time, place, or any other ideas that may determine them to this or that particular exiſtence.

By this way of abſtraction they become capable of repreſenting more individuals than one; each of which having a conformity to that abſtract idea, is of that ſort.

All things, Mr. Locke obſerves, that exiſt, being particulars, it might be expected that words ſhould be ſo too in their ſignification; but we find it quite contrary; for moſt of the words that make all languages, are general terms.

This is the effect of reaſon and neceſſity: for, 1. It is impoſſible that every particular thing ſhould have a diſtinct peculiar name; becauſe it is impoſſible to have diſtinct ideas of every particular thing, to retain its name with its peculiar appropriation to that idea. 2. It would be uſeleſs, unleſs all could be ſuppoſed to have the ſame ideas in their minds: for names applied to particular things, whereof one alone has the ideas in his mind, could not be ſignificant, or intelligible to another, who is not acquainted with all thoſe particular things which had fallen under his notice. 3. It would be of no great uſe for the improvement of knowledge; which, though founded in particular things, enlarges itſelf by general views, to which things reduced into ſorts under general names, are properly ſubſervient.

In things where we have occaſion to conſider and diſcourſe of individuals and particulars, we uſe proper names: as in perſons, countries, cities, rivers, mountains, &c.

The firſt ideas children get are only particular; as thoſe of the nurſe, or mother; and the names they give them are confined to theſe individuals: afterwards, obſerving that there are a great many other things in the world that reſemble

femble them in fhape, and other qualities, they frame an idea which they find thofe many particulars do partake in: to that they give, with others the name, *man*, for example. In this they make nothing new, but only leave out of the complex idea they had of Peter, James, Mary, &c. that which is peculiar to each, and retain only what is common to all. And thus they come to have a general name, and a general idea.

By the fame method they advance to more general names and notions; for obferving feveral things that differ from their idea of man, and which cannot, therefore, be comprehended under that name, to agree with man in fome certain qualities; by retaining only thofe qualities, and uniting them into one idea, they have another more general idea; to which, giving a name, they make a term of a more comprehenfive extenfion.

Thus, by leaving out the fhape, and fome other properties fignified by the name, man; and retaining only body with life, fenfe, and fpontaneous motion, we form the idea fignified by the name *animal*. After the fame manner, the mind proceeds to body, fubftance, and at laft to being, thing, and fuch univerfal terms, which ftand for any ideas whatfoever.

Hence, we fee the whole myftery of genus and fpecies is nothing but abftract ideas, more or lefs comprehenfive, with names annexed to them: this fhews us the reafon why, in defining words, we make ufe of the genus; namely, to fave the labour of enumerating the feveral fimple ideas, which the next general term ftands for.

From what has been faid, it is plain, that general and univerfal belong not to the real exiftence of things, but are the inventions of the underftanding, made by it for its own ufe, and concern only figns, either words or ideas. General words do not barely fignify one particular thing; for then they would not be general terms, but proper names: neither do they fignify a plurality; for then man and men would fignify the fame thing; but what they fignify is a fort of things; and this they do, by being made figns of abftract ideas in the mind; to which ideas, as things exifting are found to agree, fo they come to be ranked under that name, or to be of that fort.

The effences then of the forts, or fpecies of things, are nothing but thefe abftract ideas.

It is not denied here, that nature makes things alike, and fo lays the foundation of this forting and claffing; but the forts or fpecies themfelves are the workmanfhip of human underftanding; fo that every diftinct abftract idea is a diftinct effence; and the names that ftand for fuch diftinct ideas, are the names of things effentially different. Thus oval, circle, rain, and fnow, are effentially different. See this further illuftrated under ABSTRACTION, ESSENCE, IDEA, and SUBSTANCE.

GENERAL *Verdict, Warrant, Wind.* See the Subftantives.

GENERAL *of an Army*, is the chief commanding officer; whofe bufinefs is to regulate the march and encampment of the army; to choofe the moft advantageous ground in the day of battle; to difpofe the army; to poft the artillery; and to fend his orders, wherever there is occafion, by his aids-de-camp. At a fiege, he is to caufe the place to be invefted; to regulate the approaches and attacks; to vifit the works, and to fend out detachments for fecuring the convoy; and for foraging. See GENERALISSIMO.

The natural qualities of a general fhould be a martial genius, a folid judgment, a healthy robuft conftitution, intrepidity and felf-poffeffion on critical occafions, goodnefs of heart, and liberality: he fhould alfo be of a mean age, neither too young, becaufe he would want prudence and experience, nor too old, becaufe he would want vivacity and activity. He fhould be fteady and uniform in his conduct, affable in his difpofition, and yet inflexible in maintaining the difcipline of his army. His acquired qualities fhould be fecrecy, juftice, fobriety, temperance, knowledge of the art of war, both from theory and practice, the art of commanding and of fpeaking with precifion, great attention in preferving the lives and fupplying the wants of the foldiers, and a conftant ftudy of the characters of the officers of his army, fo that he may be capable of employing them according to their refpective talents. His conduct appears in eftablifhing his magazines in the moft convenient places; in examining the country, that he may not engage his troops too far, while he is ignorant of the means of bringing them off; in procuring fubfiftence for them; and in felecting the moft advantageous pofts for fighting, retreating, or fhunning a battle. His experience infpires his army with confidence; his quality, by creating refpect, augments his authority; his liberality enables him to procure intelligence of the ftrength and defigns of the enemy, and thus to take the moft fuccefsful meafures. In a word, a general ought to be fond of glory, to have an averfion to flattery, to render himfelf beloved, and to keep a ftrict difcipline and fubordination.

In the day of battle, the ftation of a general is with the referve, where he remains fo fituated, that he can fee every thing which is going forward; and by means of his own obfervations, or the communications of his aids-de-camp, he is enabled to fend reinforcements, as the exigences of the conflict may require.

GENERAL, *Adjutant*, is an officer who attends the general, affifts in council, and carries the general's orders to the army. He diftributes the daily orders to the majors of brigade. He is likewife charged with the general detail of the duty of the army. The majors of brigade fend every morning to the adjutant-general an exact return, by battalion and company, of the men of their brigade. In a day of battle, the adjutant-general fees the infantry drawn up, after which he places himfelf by the general, to receive any orders which may regard the corps of which he has the detail. In a fiege, he orders the number of workmen required, and figns the warrants of their payment. He receives the guards of the trenches at their rendezvous, and examines their condition; he gives and figns all orders for parties; he has an orderly ferjeant from each brigade of infantry in the line, to carry fuch orders as he may have occafion to fend from the general. See ADJUTANT.

GENERAL *of the Artillery*. See ARTILLERY.

GENERAL, *Brigadier*, is next in rank, in the Britifh fervice, to that of major-general, being fuperior to all colonels, and having a feparate command. Brigadier-generals are not entitled to aids-de-camp; but they have each one brigade-major. See BRIGADIER.

GENERAL, *Brigade-Major*. As England and Scotland have been divided into different diftricts, each diftrict being under the command of a general officer, it has been found neceffary, for the difpatch of bufinefs, to eftablifh an office, which fhall be folely confined to brigade duties.

The firft brigade-major-general was appointed in 1797. Since this period all orders relative to corps of officers, which are tranfmitted from the commander-in-chief to the generals of diftricts, pafs through this channel of intermediate communication.

By the laft general regulations, it is particularly directed, that all general officers commanding brigades, fhall very

minutely inſpect the internal economy and diſcipline of the ſeveral regiments under their order.

They are frequently to viſit the hoſpitals and guards. On arriving in camp they are never to leave their brigades till the tents are pitched, and the guards poſted; they muſt always encamp with their brigades, unleſs quarters can be procured for them immediately in the vicinity of their camp. General officers muſt not at any time change the quarters aſſigned them, without leave from head-quarters.

All general officers ſhould make themſelves acquainted, as ſoon as poſſible, with the ſituation of the country near the camp, with the roads, paſſes, bridges, &c. leading to it; and likewiſe with the out-poſts, that in caſe they ſhould be ordered ſuddenly to ſuſtain, or defend any poſt, they may be able to march without waiting for guides, and be competent, from a topographical knowledge of the country, to form the beſt diſpoſition for the ſervice. They ſhould inſtruct their aids-de-camp in theſe particulars, and always require their attendance when they viſit the out-poſts.

All general officers, and others in conſiderable command, muſt make themſelves thoroughly acquainted with the nature of the country, the quality of the roads, every circuitous acceſs through vallies or openings, the relative height of the neighbouring hills, and the courſe of rivers, which are to be found within the ſpace entruſted to their care. Theſe important objects may be attained by maps, by acquired local information, and by unremitting activity and obſervation. And if it ſhould ever be the fate of a country, interſected as Great Britain is, to act upon the defenſive, a full and accurate poſſeſſion of all its faſtneſſes, &c. muſt give each general officer a decided advantage over the commanding officer of an enemy, who cannot have examined the ground upon which he may be reduced to fight, and muſt be embarraſſed in every forward movement that he makes. Although guides may ſerve, and ought always to be uſed in the common operations of marches, there are occaſions where the eye and intelligence of the principal officers muſt determine the movements of troops, and enable them to ſeize and improve every advantage that occurs as the enemy approaches.

General officers on ſervice abroad, or commanding diſtricts at home, may appoint their own aids-de-camp and brigade-majors. The latter, however, are to be conſidered as officers attached to their ſeveral brigades, not perſonally to the officers commanding them. The former are their habitual attendants and domeſtic inmates. In the ſelection of aids-de-camp and brigade-majors, too much attention cannot be given to their requiſite qualifications; and that general would not only commit an act of injuſtice againſt the intereſts of his country, but deſerve the ſevereſt cenſure and diſpleaſure of his ſovereign, who, through motives of private convenience, family connection, or convivial recommendation, could ſo far forget his duty, as to prefer an unexperienced ſtripling, to a character marked by a knowledge of the profeſſion, a zeal for the ſervice, and an irreproachable conduct.

General, *Colonel*, an honorary title, or military rank, which is conferred in foreign ſervices. Thus, the prince of peace in Spain is colonel-general of the Swiſs-guards.

General *of a Diſtrict*, a general officer, who has the charge and ſuperintendance of a certain extent of country, in which troops are encamped, quartered, or cantoned. He is entitled to have three aids-de-camp, and one brigade-major. He receives reports, &c. from the major-general, reſpecting the troops in his diſtrict; reviews and inſpects them, and likewiſe orders field-days of the whole, brigaded, or by ſeparate corps, when and in what part he pleaſes, making the neceſſary reports to the war-office, commander-in-chief, &c.

General *of Foot*, is an officer under the chief general, who has an abſolute command of the foot of the army.

General *of Horſe*, is an officer next under the chief general, who has an abſolute command of the horſe of an army, above the lieutenant-generals.

General, *Lieutenant*, is the firſt military dignity after that of a general. One part of their function is to aſſiſt the general with counſel; and, therefore, this officer ought, if poſſible, to poſſeſs the ſame qualities with the general himſelf; and this is the more neceſſary, as he often commands armies in chief, or ſucceeds to the command on the death of the general.

Lieutenant-generals have been of late multiplied in Europe, in proportion as the armies have become more numerous. They ſerve either in the field, or in ſieges, according to the dates of their commiſſions. In battle the eldeſt commands the right wing of the army, the ſecond the left wing, the third the centre, the fourth the right wing of the ſecond line, the fifth the left wing, the ſixth the centre, and ſo on. In ſieges the lieutenant-generals always command the right of the principal attack, and order what they judge proper for the advancement of the ſiege, during the 24 hours they are in the trenches, except the attacks, which they are not to make, without an order from the general-in-chief. Lieutenant-generals are entitled to two aids-de-camp.

General *of Artillery*, *Lieutenant*, is ſuppoſed to be an able mathematician and engineer, to know all the powers of artillery, to underſtand the attack and defence of fortified places, in all their different branches, and how to diſpoſe of the artillery in the day of battle to the greateſt advantage; to conduct its march and retreat; and alſo to be well acquainted with the numerous apparatus belonging to the train, laboratory, &c.

General, *Major*, the next officer to the lieutenant-general; whoſe office it is to receive orders from the general, or, in caſe of his abſence, from the lieutenant-general of the day; which orders he is to diſtribute to the brigade-majors, with whom he is to regulate the guards, convoys, detachments, &c. On him the whole fatigue and detail of duty of the army reſt. It is the major-general of the day who is charged with the encampment of the army, who places himſelf at the head of it, when it marches, who marks out the ground of the camp to the quarter-maſter-general, and who places the new guards for the ſafety of the camp. On the day when the army is to march, he dictates to the field-officers the order of the march, which he has received from the general, and on other days he gives them the parole. In a fixed camp he is charged with the foraging, with reconnoitring the ground for it, poſting the eſcorts, &c. In ſieges, when two ſeparate attacks are made, the ſecond belongs to him; but if there be only one, he takes either from the right or left of the attack, that which has not been choſen by the lieutenant-general. When the army is under arms, he aſſiſts the lieutenant-general, and executes his orders. If the army marches to an engagement, his poſt is at the head of the guards of the army, until they are near enough to the enemy, to enjoin their different corps; after which he returns to his own proper poſt; for the major-generals are diſpoſed in the order of battle as the lieutenant-generals are, to whom, however, they are ſubordinate, for the command of their diviſions. The major-general has one aid-de-camp and one brigade-major.

General

General is alfo ufed, in a monaftic fenfe, for the chief of an order; or of all the houfes or congregations eftablifhed under the fame rule.

Thus we fay the general of the Ciftercians, the Francifcans, &c.

F. Thomaffin derives the origin of generals of orders from the privileges granted by the ancient patriarchs to the monafteries fituate in their capital cities. By fuch means they were exempted from the jurifdiction of the bifhop, and immediately fubjected to that of the patriarch alone.

General *of the Jefuits*. See Jesuits, and Adjutant.

General is alfo ufed, in the *Military Art*, for a particular march, or beat of drum; being the firft which gives notice, commonly in the morning early, for the infantry to be in readinefs to march. See Drum.

GENERALISATION, in the *Philofophy of the Human Mind*, denotes, according to profeffor Stewart, nothing more than the capacity of employing general terms; though fome philofophers have fuppofed that it is a faculty of the mind diftinct from abftraction, and neceffary to account for the formation of genera and fpecies; and they have endeavoured to fhew, that although generalization without abftraction is impoffible; yet, that you might have been fo formed, as to be able to abftract, without being capable of generalizing. Stewart's Elements, &c. p. 159, &c. See Abstraction.

GENERALISSIMO, called alfo *Captain-General*, and fimply *General*, is an officer who commands all the military powers of a nation; who gives orders to all the other general officers; and receives no orders himfelf but from the king. He holds this important truft under various titles, as captain-general in England and Spain, feldt-marefchal in Germany, or marefchal in France. In the Britifh fervice the king is conftitutionally, and in his own proper right, captain-general. He has ten aids-de-camps; every one of whom enjoys the brevet rank of full colonel in the army. Next to his majefty is the commander-in-chief, whom he fometimes honours with the title of captain-general.

Monf. Balfac obferves that the cardinal de Richelieu firft coined the word, generaliffimo, of his own abfolute authority, upon his going to command the French army in Italy.

GENERATE, in *Mufic*, is ufed to fignify the operation of that mechanical power in nature, which every found has in producing one or more different founds. Thus, any given found, however fimple, produces, together with itfelf, its octave, and two other founds, extremely fharp, *viz.* its twelfth above, *i. e.* the octave of its fifth, and the other the feventeenth above, or the double octave of its third major. Whether we fuppofe this procreation of founds to refult from an aptitude in the texture and magnitude of certain particles in the air, for conveying to one's ears vibrations that bear thofe proportions to one another, as being determined at once by the partial and total ofcillations of any mufical ftring; or from whatever economy of nature we chufe to trace it; the power of one found thus to produce another, when in action, is faid to "generate." The fame word is applied by Tartini and his followers to any two founds, which, fimultaneoufly heard, produce a third. See Generator.

GENERATED, or Genited, is ufed by fome mathematical writers, for whatever is produced, either in arithmetic by the multiplication, divifion, or extraction of roots; or in geometry, by the invention of the contents, areas, and fides; or of extreme and mean proportionals, without arithmetical addition and fubtraction. Thus, 20 is the product generated of 4 and 5; ab that of a and b; 4, 8, 16, &c. the powers generated from the root 2, and a^2, a^3, a^4 &c. thofe from the root a. Thus alfo, a circle is generated by the revolution of a line about one of its extremities, a right cone by the rotation of a right-angled triangle about its perpendicular, a cylinder by the rotation of a rectangle about one of its fides, or by the motion of a circle in the direction of a right line, whilft it always keeps parallel to itfelf.

GENERATING Line, or *Figure*, in *Geometry*, is that which, by its motion of revolution, produces any other figure, plane, or folid. Thus, a line, according to Euclid, generates a circle, a right-angled triangle, a right cone, &c. (fee the preceding article); and thus alfo Archimedes fuppofes his fpirals to be generated by the motions of generating points and lines; and the figure thus generated is called the "generant." In geometry it is a general theorem, that the meafure of any generant, or figure produced by any kind of motion of any other figure, or generating quantity, is equal to the product of this generating quantity drawn into the length of the path defcribed by its centre of gravity, whatever the kind of motion may be, whether rotatory, or direct, &c. (See Centro-baryc *Method*.) In the modern analyfis, or fluxions, all forts of quantities are confidered as generated by fome fuch motion, and the quantity hereby generated is called a fluent. See Fluent and Fluxion. See Genesis.

GENERATION, in *Mathematics*, denotes the formation or production of any geometrical figure, or other quantities, as any of thofe mentioned in the preceding articles; and the term is alfo applied to equations, &c.

Generation, in *Phyfics*, denotes the act of procreating, or producing a thing which before was not: or, the total change or converfion of a body into a new one, which retains no fenfible part, or mark of its former ftate.

Thus, fire is faid to be generated, when we perceive it to be where before was only wood, or other fuel: or when the wood is fo changed as to retain no fenfible character of wood: thus, alfo, a chick is faid to be generated, when we perceive the chick, where before was only an egg; or when the egg is changed into the form of a chick.

In generation, there is not properly any production of new parts, but only a new modification or manner of exiftence of the old ones; by this, generation is diftinguifhed from *creation*.

It is diftinguifhed from *alteration*, in that the fubject, in this latter, remains apparently the fame; and only the accidents or affections are changed; as when the fame body is to-day well, and to-morrow fick; or that brafs, which before was round, is now fquare.

Laftly, generation ftands oppofed to *corruption*, which is the utter extinction of a former thing: as when that which before was wood, or an egg, is no longer the one or the other, whence it appears, that the generation of one thing is the corruption of another.

The Peripatetics explain generation by a change or paffage from a privation, or want of a fubftantial form, to the having of fuch a form. The moderns allow of no other change in generation, than what is local: according to them it is only a tranfpofition, or new arrangement of parts; and thus the fame matter fhall fucceffively undergo an infinity of generations.

A grain

A grain of wheat, *e. gr.* is committed to the ground: this, imbibing the humidity of the foil, becomes turgid, and dilates to fuch a degree, that it becomes a plant; and, by a continual acceffion of matter, ripens by degrees into an ear; and at length into new feed. This feed, ground in the mill, appears in form of flour; which, mixed up with water, makes a pafte; whereof, with the addition of yeaft, fire, &c. bread is generated; and this bread, broken with the teeth, digefted in the ftomach, and conveyed through the canals of the body, becomes flefh.

Now, in all this feries of generation, the only thing effected is a local motion of the parts of the matter, and their fetling again in a different order; fo that, in reality, wherever there is new arrangement or compofition of elements, there is a new generation; and, therefore, generation is finally reducible to motion.

END OF VOLUME XV.

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